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Diseases of the Male Urethra

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THE DISEASES

OF THE

MALE URETHRA

BY

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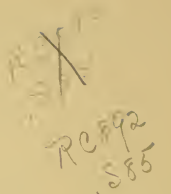
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INTRODUCTION.

It may be justly asserted that in no part of the human frame does an accurate conception of its structure and functions have so important a bearing on the proper understanding of its diseases as in the urethra, and it may be said with equal justice that in no other part of the human frame have such erroneous anatomical and pathological views been so obstinately maintained.

Until recent years the medical profession has failed to apply to the urethra the same sound reasoning, based on a knowledge of pathology, which has been applied to other parts of the body. This is partly attributable to the fact that during life the facilities for examining the urethra have been imperfect, and the opportunities for examining it after death have been neglected; and partly to the dogmatic views on the subject which have been taught by recognized authorities, and accepted, like gospel truths, more on the faith in the infallibility of the teacher than on the exposition by these views of obscure points in urethral diseases.

With the advent of improved instruments for intra-urethral inspection, together with the general advancement in our knowledge of bacteriological and pathological subjects, a new era in urethral pathology has been ushered in and many radical advances have been made, not only in the pathology but also in the treatment of urethral diseases.

It will be the object of the writer to place before the reader the diseases of the urethra, as viewed from the modern stand-point, promising, however, that those facts relating to the subject that are too well established to be open for discussion will be dwelt upon as briefly as is consistent with their proper elucidation.

The pathology of stricture and its relationship to gleet will be entered into, perhaps more fully than its importance would apparently justify; but to those who are familiar with the conflicting views entertained on this subject, and the far-reaching influence which such views exert on the treatment of chronic urethritis, an apology is unnecessary.

In a work of such limited scope as the present one, it is considered advisable to confine it as closely as possible to the discussion of the acute and chronic inflammations and stricture of the urethra, leaving out the diseases of the urethra that are, on account of their rarity, unimportant. It will be necessary, however, in order to cover the ground in a satisfactory manner, to include a description of the inflammatory diseases of the important glands which communicate with the urethra, namely, Cowper's glands, the glands of the prostate, the epididymis, and the seminal vesicles.

DISEASES OF THE URETHRA.

CHAPTER I.

THE ANATOMY OF THE MALE URETHRA.

The urethra (Figs. 1 and 2) is that portion of the genito-urinary apparatus that has for its function the conveyance from the body of the urinary and seminal secretions. When it is in a state of quiescence, or not performing the functions stated, its canal is obliterated, and its mucous surfaces retained in apposition by the elasticity and contractility of the submucous connective and muscular tissues which surround it throughout its entire extent. At certain places the muscular tissues become more markedly developed than at others, forming distinct bands, having particular functions to perform, and deserving of the closest attention, since a knowledge of their situation and function is essential to the understanding of many of the phenomena of urethral diseases. The vesical orifice of the urethra is surrounded by a ring of involuntary non-striated muscular fibres, the tonic contraction of which, acting as a sphincter, offers a barrier to the passage of urine from the bladder. This muscle is called the sphincter vesicæ internus. Numerous longitudinal muscular fibres of the bladder pass into the substance of the prostate gland, to become continuous with its muscular structure.

These muscular fibres radiate from the vesical orifice of the urethra along the vesical wall, and by their contraction during the act of urination tend to open the orifice of the urethra, and are, therefore, antagonistic to the

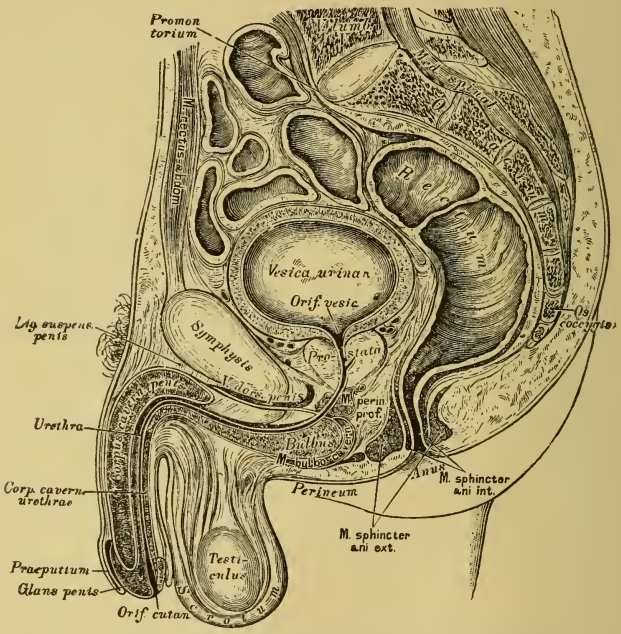


FIG. 1.—Sagittal Section of the Male Generative Organs (Hitzmann).

action of the sphincter vesicæ internus. The two well-marked muscular bands which form the lateral boundaries of the trigone are especially active, their contraction tending to open the vesical orifice at their prostatic termination and closing the orifice of the ureters at their

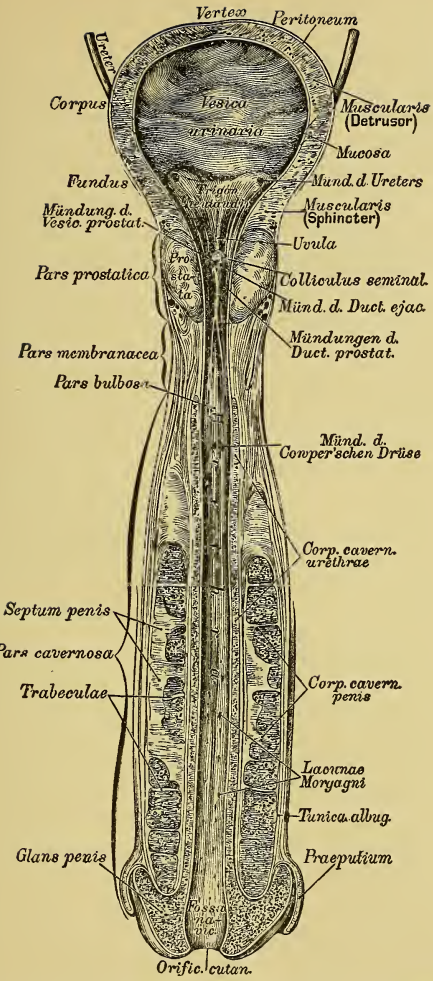


FIG. 2.—The Urethra and Bladder Opened from Above (Hitzmann).

vesical termination, thus saving the delicate ureters and secreting portion of the kidneys from injurious distention during the act of urination. When the bladder is distended the tension of its wall acting on the vesical orifice of the urethra overcomes the sphincteric action of the internal sphincter, and the urine leaks into the posterior urethra, which in this condition virtually forms a portion of the bladder, and for this reason is often called the neck of the bladder (Fig. 3). The further progress of the urine is barred by the sphincteric action of two muscles surrounding the urethra at, and immediately in front of, the apex of the prostate gland. The first is called the sphincter vesicæ externus. It is a band of striated and non-striated muscular fibres, situated at the apex of the prostate. The second is called the compressor urethræ. It is a voluntary or striated muscle, and lies between the two layers of the triangular ligament, to which, and to the ischio-pubic rami on either side, it is attached. Weaving itself in various directions—above, below, and around the membranous portion of the urethra—it forms, with the adjacent circular muscle situated at the apex of the prostate, the external sphincter of the bladder. This sphincter is much more powerful than the internal sphincter, and offers a greater resistance to the passage of fluids or instruments. It is therefore the principal barrier to the passage forward of the urine from the bladder, and to the passage backward of urethral secretions or injections, and to this fact the clinical division of the urethra into an anterior and a posterior portion is due.

Fig. 3 shows the situation of these muscles and the effect on the posterior urethra of a distended bladder, the empty bladder being represented by the dotted lines.

The bulbous portion of the urethra is surrounded by the bulbo-cavernosus, or ejaculator urinæ muscle, which plays an important rôle in expelling the last drops of urine, and in the expulsion of the seminal fluid during ejaculation. By contracting on the extremely vascular bulb it sends a vascular impulse forward through the lacunæ of the corpus spongiosum, which, in its course, by closely approximating the urethral wall, empties its canal.

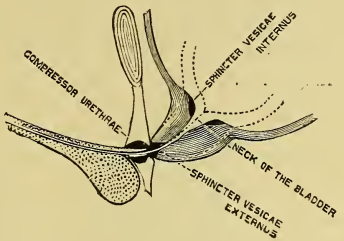


FIG. 3.—Diagram Showing the Muscles of the Posterior Urethra and the Effect of a Distended Bladder on the Internal Sphincter.

The muscular tissue of the pendulous portion is unimportant and need not concern us.

The superficial cells of the mucous membrane of the urethra are long and columnar, with the exception of a short distance (5 to 8 mm.) from the external orifice, where they are squamous, and where the subjacent membrane is beset with papillæ. The epithelium rests on a basement membrane, external to which is a layer of convoluted vascular tissue which is separated from the proper substance of the spongy body by a layer of circular non-striated muscular fibres.

The urethra is beset with small racemose glands called the glands of Littre (Fig. 4). In addition to these there are numerous lacunæ of considerable length (10 to 20 mm.), consisting of a reduplication or infolding of the mucous membrane, forming a deep cul-de-sac whose axis lies obliquely to the urethra, those in the anterior urethra

opening toward the external meatus; those in the posterior urethra, according to Belfield, opening toward the bladder.

On the roof of the fossa navicularis one of these lacunæ attains enormous dimensions and is called the lacuna magna. Its orifice is guarded by a fold of mucous mem-

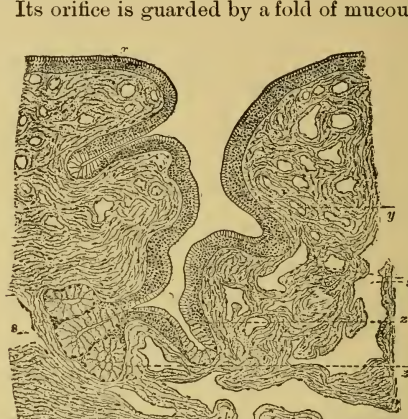


FIG. 4.—Section Through a Gland of Littre (Taylor).

brane which sometimes offers an obstruction to the passage of small urethral instruments, which may be deflected into the lacunæ instead of passing along the urethra.

Opening into the floor of the bulbous portion of the urethra are the ducts, one on either side, of Cowper's glands. These two little bodies are compound racemose glands. They lie between the two layers of the trian-

gular ligament, close to the membranous urethra. Their ducts extend forward about one and a half inch, and pour a thin viscid secretion into the bulbous urethra. The urethral glands and diverticulæ are important, from a pathological stand-point, owing to the fact that they are open to the invasion of the gonococci and from their location are but little amenable to local treatment. It frequently happens, therefore, that the implication of the urethral glands and lacunæ in the gonorrhœal process perpetuates the disease in a chronic form, and it has often been observed that chronic lesions are most apt to be found in those portions of the urethra where the lacunæ are most numerous.

Reference has been made to the division of the urethra into an anterior and a posterior portion, the dividing point being the part grasped by the compressor urethræ. There are good anatomical, and still better clinical, reasons why we should adopt this division. These reasons will be brought out more fully in the body of the work, and, therefore, it will be unnecessary to enter into the subject here, further than to say that the anterior urethra comprises that portion which extends from the compressor urethra forward to the meatus, and that the posterior urethra comprises that portion which extends from the compressor urethræ backward to the bladder.

It is presumed that the reader is familiar with the anatomical divisions of the urethra into prostatic, membranous, bulbous, and pendulous portions, and therefore no description will be necessary when reference is made to these anatomical divisions.

CHAPTER II.

ACUTE ANTERIOR URETHRITIS (GONORRHŒA).

Etiology.

The mucous membrane of the urethra is singularly well protected from atmospheric infection or climatic vicissitudes. It is not like the mucous membrane of the respiratory tract, exposed to the passage through it of air which is unstable in temperature and often laden with pathogenic micro-organisms. Nor like the alimentary tract is it exposed to mechanical or chemical irritants and the presence of decomposing material. Yet in spite of the fact that Nature has shielded it most carefully from extrinsic sources of infection, it is of all the mucous membranes the one which suffers most acutely from infectious diseases. An acute urethritis may be due to any one of a number of causes—for instance, mechanical or chemical irritation, if of sufficient intensity, will produce an acute inflammation of the urethra, the onset of which is rapid, reaching its acme in a few hours and subsiding in a few days. But this does not explain the cause of the very great majority of urethral inflammations which develop several days after sexual contact, and, for a time, increase in severity, requiring for their subsidence as many weeks as the former variety requires days, and carrying with it the property of infectiousness.

It is but natural, therefore, that this malady, which is

as old as history and as prevalent as vice, should be attributed to the growth in the urethra of a micro-organism, since it required for its development a period of incubation, for its acme a definite period representing its gradual invasion of the urethra, and a stationary and declining period of nearly definite limit.

It would be needless to review the claims that have been made at various times for the discovery of the micro-organism which produces gonorrhœa, each of which were in turn discarded, until, in 1879, Neisser announced the discovery of a diplococcus, called after its discoverer the gonococcus of Neisser, which he proved was the direct cause of the disease. The presence of this micro-organism has been constantly shown in the acute infectious inflammations and in all chronic inflammations of the urethra that retain infecting properties. Its presence has also been demonstrated in gonorrhœal ophthalmia, in ophthalmia neonatorum, in the secretions of gonorrhœal vaginitis and endometritis, also in the pelvic inflammations of the female that are of gonorrhœal origin. It is doubtful if the gonococci will flourish in the mucous membrane of the nose or mouth, but they have been detected in the rectum in cases of gonorrhœal proctitis and in the synovial fluid of joints affected with gonorrhœal rheumatism. In addition to the demonstration of the gonococci in the tissues affected with gonorrhœal inflammation, cultures of the gonococci have been made and gonorrhœa has been produced from these cultures, even when the twentieth generation has been inoculated in the urethra.

So convincing has become the cumulative evidence of the causative relationship of the gonococcus of Neisser to infectious urethritis or gonorrhœa, that the subject has

passed beyond the debatable stage, and all opposition has practically vanished before the arguments and evidence in its favor.

While we may justly concede to the gonococcus the unenviable position of etiological factor in the production of gonorrhœa, we will commit an error if we permit it to occupy the entire domain in the production of acute urethritis, for it has been shown by a number of observers —and the number is steadily increasing — that other micro-organisms than the gonococci may produce urethral suppuration, and are not infrequently present in acute urethritis when the gonococci are absent. It has been shown also that the healthy urethra may be the habitat of pyogenic micro-organisms that remain inactive until a favorable exciting cause, that may be non-venereal, enables them to assume an aggressive attitude toward the urethra. Figs. 5, 6, 7, 8, and 9 (after Lustgarten) show the micro-organisms that may be found in the male urethra.

It will be seen, therefore, that we may recognize, according to the cause, three forms of acute urethritis.

First. Acute urethritis due to the growth of the gonococci in the urethra. This variety comprises the great majority of acute urethral inflammations and is remarkable for the highly infectious nature of the urethral discharge.

Second. Acute urethritis due to other micro-organisms than the gonococci. These cases usually pursue a milder course than the preceding variety, and the discharge is either not infectious, or if so, to a very slight extent.

Third. Acute urethritis due purely to mechanical or chemical causes. The discharge from this variety of urethritis is not infectious, unless there should be an ac-

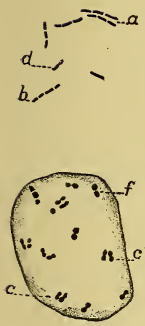


FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.



FIG. 9.

FIGS. 5, 6, and 7.—Micro-organisms of the Normal Urethra. FIG. 5.—*a* and *b*, Bacilli Resembling Tubercle Bacilli. FIG. 6.—Hyaline Epithelial Cell containing Streptococci. FIG. 7.—Epithelial Cell containing Pseudo-Gonococcus. FIG. 8.—Pure Culture of the latter on Agar. FIG. 9.—Gonococci from Gonorrhœal Pus: 1-1000 diameters. (After Lustgarten.)

cidental inoculation of the urethra at the same time with pyogenic micro-organisms.

It will be advisable, however, to consider these varieties of urethritis together under the general term of acute urethritis, special mention will only be made of each variety when it is necessary to do so in order to prevent confusion.

The gonococci have but a low vitality and are easily destroyed by extremes of temperature, they cannot be inoculated in the lower animals, and they will perish if exposed to the atmosphere for a time. The sterilization of urethral instruments, therefore, offers no great difficulty, and the conveyance of a gonorrhœa by such means is improbable, if the ordinary precautions regarding cleanliness are observed.

The microscopic examination of the urethral secretion is of great diagnostic importance, and the genito-urinary surgeon should be familiar with the methods of staining and examining the gonococci (Figs. 9 and 10), which are usually found in pairs, the approximating surfaces being flattened. They lie for the most part in the interior of the cells, often in such numbers that the cell is packed full of them, but they are also found free in the secretion, probably as a result of their liberation by the bursting of the gonococci-laden cells.

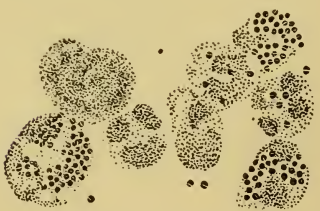


FIG. 10.—Gonococci from Gonorrhœal Pus (American Text-book of Surgery).

The method of preparing and examining the urethral

secretion for gonococci is as follows (Quoted from Hyde and Montgomery's "Manual of Syphilis and Venereal Diseases," page 363):

"In selecting gonorrhœal pus for examination it is well to avoid that found at the meatus, as this pus is more liable to contain other organisms that might render the examination complicated and confusing. It is better to obtain pus that may be squeezed out of a deeper portion of the urethra. A small drop of this pus is thinly spread on a slide or a cover-glass, by means of a platinum wire, or by pressing the drop between two cover-glasses and then slipping apart. The thin film is allowed to dry in the air, and is then fastened to the glass by slowly passing it three times through the tip of the flame of an alcohol lamp or a Bunsen burner, the pus-covered side being upward. The film is then covered with a few drops of the staining fluid, or the cover-glass is floated, film side down, on the liquid. The preparation should remain in the stain from one to five minutes, depending upon the strength of the solution, after which the surplus stain is gently washed off with a jet of cold water. The specimen can now be examined in water or glycerine, or, what is better, it can be dried carefully with soft blotting-paper and mounted in Canada balsam.

"The stain employed may be almost any of the basic aniline dyes, as methyl-blue, Victoria-blue, methyl-violet, gentian-violet, or fuchsin. These dyes may be used in aqueous solutions of varying strength, but they do not keep well, and it is best to prepare the fluid each time it is wanted. This may easily be done by keeping on hand a saturated alcoholic solution of the stain, a very small quantity of which can be added, drop by drop, to a watch-glassful of distilled water until the latter is of the required strength and color. The following is a rapid and satisfactory method: A solution of methyl-blue is prepared by dropping a saturated alcoholic solution of

the stain into a watch-glassful of distilled water, or into a solution of potassium hydrate (1 to 10,000) until the liquid has a dark blue color. The cover-glass, prepared in accordance with the above directions, is floated on this liquid, pus side down, for from one to two minutes; it is then taken out and the surplus stain is washed off. It may now be placed at once, without drying, upon a slide and examined, or it may be carefully dried and mounted on a slide with Canada balsam. In a specimen thus prepared the gonococci appear dark blue, while the cells show a very pale blue protoplasm and grayish-blue nuclei."

While no great difficulty attends the demonstration of the gonococci in acute gonorrhœa, the same cannot be said in cases of chronic gonorrhœa where the gonococci may be absent or may be confounded with other diplococci that may be present. Weichselbaum says:

"It is just as difficult to recognize gonococci in the chronic stage of the gonorrhœal inflammation as it is easy to do so in cases where the process is quite recent, as in the former the specific cocci are present in very small numbers, and may be very hard to distinguish from other cocci, perhaps occurring along with them (as, for example, in chronic gonorrhœal inflammations of the female genital tract), if they happen not to lie in the interior of the cells. In such cases when examining the living, artificial intensification of the process by the injection of a weak solution of corrosive sublimate may afford help, thus leading to a multiplication of the gonococci while the other bacteria are destroyed; for the purpose of distinguishing the gonococci from other cocci, cover-glass preparations are first treated by Gram's method and afterward stained for five seconds with alkaline methyl-blue which has been diluted with four times the quantity of water, by which means the gonococci are stained blue, but the rest of the bacteria blackish. A still more cer-

tain method, however, in doubtful cases, is to prepare plate cultures from the secretion, using for this purpose human serum to which an equal quantity of warm agar solution has been added in order to make it solidify."

The demonstration of the gonococci in the urethral discharge stamps it at once as both venereal and infectious, and establishes indubitably the nature of the disease. Yet the microscopical examination for gonococci as a diagnostic agent in the differential diagnosis of urethral diseases is of less importance than at first sight it may seem, and we no longer, as formerly, resort to it on all occasions. The reasons for this are the difficulties attending bacteriological examinations in general, often requiring more experience, facilities, and time than the average practitioner can furnish. To this may be added the fact that, owing to their resemblance morphologically and in their reaction to staining fluids with other diplococci found not infrequently in the urethral secretions, a positive diagnosis cannot always be made even where the utmost care is taken, and if such a diagnosis is made it is open to the unanswerable criticism that it may be inaccurate. Even Neisser admits that about five per cent. of the cases where gonococci are diagnosed as present are open to doubt and error.

The only absolute proof of the presence of gonococci is by culture and inoculation experiments, and the former is too laborious to be practicable, and the latter is obviously unjustifiable, since such inoculations must be carried on in the human urethra, as the gonococci cannot be inoculated in the mucosa of the lower animals.

Another deterrent to the range of usefulness of the microscope is the fact that it is in the cases where the demonstration of the gonococci are most important that

the greatest difficulties are met with, namely, in chronic urethral discharges, where the gonococci may be in such few numbers that it is only after repeated examinations that they can be detected. In acute urethritis, where the gonococci are abundant and easily demonstrated, the clinical features are usually so diagnostic that he who runs may read, and confirmatory evidence obtained by a microscopical examination will rarely be necessary.

It therefore happens that we have settled back to the comfortable position of relying chiefly on the clinical diagnosis of urethral inflammations, only bringing the microscope into requisition when the clinical diagnosis is difficult or impossible.

Acute anterior urethritis, or gonorrhœa, is derived by sexual contact with a female suffering from gonorrhœa. It is not necessary, however, for the female from whom the gonorrhœa is acquired to have the disease in an acute form, as she may still retain infecting properties when the inflammation has subsided to such a degree as to be unrecognizable by inspection. It is not even absolutely necessary that she should have the disease in any form, for well-authenticated cases are on record where two lovers have worshipped at the same shrine, the first, having a gonorrhœa, transmits the disease to the second through the medium of the mistress, the latter remaining immune.

There is often a singular tendency among the recipients of a gonorrhœa to shield the donor, and to attribute its source to less probable causes, such as a sprain, overexertion, wet feet, or alcoholic excesses, while an insinuation against the virtue of the mistress, or the possibility of her sharing her favors is indignantly repelled. On the other hand, not infrequently a married man, who is

perfectly faithful to his marital vows, will present himself with all the symptoms of an acute gonorrhœa, and bluntly ask you how he came to acquire it. In such cases considerable tact and diplomacy may be required to prevent the incrimination of a possibly innocent woman.

A man may after sexual intercourse acquire a urethritis because he himself at some previous time had suffered from a gonorrhœa which had apparently disappeared, but in reality had lingered in some damaged patch or glandular crypt in his urethra, and only required a favorable cause, such as sexual excess or intemperance, to bring on a renewed activity and reinfect the whole urethra. Or he may be inoculated with other pyogenic micro-organisms, such as the staphylococcus or streptococcus, which may have innocently enough found a habitat in his own urethra or in the vagina of his partner. Such occurrences are probably rare, but that they may occur is sufficient warrant for us to give the accused the benefit of the doubt, if by so doing we may possibly be shielding an innocent woman from a manifest injustice.

This disease has been innocently acquired from a soiled water-closet, or purposely by inoculation, but authenticated cases of this kind are so rare as to be deservedly ranked among the curiosities of medicine.

The exposed portion of the meatus is naturally the point of inoculation, at which point the gonococci at once begin to propagate their kind, and to invade the urethral mucosa. It is usually several days before a visible inflammatory reaction results from the invasion of the gonococci. This period is called the period of incubation.

The incubation period of a gonorrhœa is not a constant one, the variations may be dependent on the virility or

quantity of the gonococci deposited on the urethra, or the more or less favorable condition of the latter to the invasion of the micro-organism.

In thirty-nine cases in which Lanz verified the diagnosis by the demonstration of the presence of gonococci the period of incubation was as follows:

Days.	Cases.	Days.	Cases.
1	2	8	1
3	15	10	1
4	4	14	1
5	9	20	2
7	4		

Taylor has recorded the incubation period in 505 cases of first infections as follows:

Days.	Cases.	Days.	Cases.
1	1	8	35
2	17	9	47
3	67	10	27
4	79	11	6
5	66	12	3
6	36	13	2
7	105	14	14

A gonorrhœa may therefore in exceptional cases appear as early as one day or as late as twenty days from the period of infection, but the great majority of cases have an incubation period of from three to seven days. Where the gonococci were placed in the urethra for experimental purposes, the period of incubation has been from two to three days; but in these cases we may infer that not only a greater quantity of the micro-organisms was transferred to the urethra, but also that they were placed in more intimate contact with the urethral epithelium than occurs under ordinary circumstances.

An acute inflammation of the urethra that is due to

mechanical or chemical irritation has no period of incubation, or at most a few hours after the advent of the exciting cause. Where the inflammation is due to an exacerbation of a previously latent gonorrhœa, the incubation period is usually very short, rarely over twenty-four hours. All such are, therefore, usually easily differentiated from acquired gonorrhœa, which has an incubation period of several days.

CHAPTER III.

ACUTE ANTERIOR URETHRITIS.

Symptoms and Course.

The course of a typical uncomplicated case of gonorrhœa is usually as follows: After a period of incubation varying from three to seven days, during which the gonococci have been propagating their kind at the point of inoculation, and invading the urethra in the immediate vicinity, a visible inflammatory reaction is manifested, as a slight swelling and hyperæmia of the lips of the meatus, accompanied with an itching of the parts that may be slightly painful during and immediately after urination.

The gonococci penetrate between the epithelial cells lining the urethra, passing to the deepest portion of the lacunæ and glands of Littre. They may invade the submucosa, but are there found in much fewer numbers than in the mucosa, for in the former situation they have to contend with the free vascular supply of the tissues, which furnishes an army of white blood-cells, and if we accept the theory of Metschnikoff, combats the invading micro-organisms by taking them up and carrying them to the free surface of the urethra; hence the purulent discharge so characteristic of the disease.

The gonococci are propagated between the layers of the epithelium, and to a still greater extent on its free surface, and infect the urethra by a process of extension

along the surface, and to a lesser extent by extension in the tissues of the urethra itself. It will be seen therefore that accidental circumstances, such as injections or instrumental interference, may modify the natural course of the disease by carrying the gonococci backward and more rapidly infecting the deeper portion of the urethra.

The theory that has recently been brought forward, that infection of the entire urethra takes place almost simultaneously, through the medium of the lymphatics, seems scarcely probable, and is opposed to the clinical experience of most observers. This theory is advanced to strengthen the statement that infection of the posterior urethra is so common that it should be considered rather as a part of a typical gonorrhœa than as a complication. I cannot give support to either the theory or statement, but must hold in the light of my own clinical experience and investigation, which coincides with that of the majority of writers on the subject, that infection travels chiefly by extension along the free surface of the urethra, and that it, in uncomplicated cases, is arrested at the part grasped by the compressor urethræ, for the reason that at this point the secretions are prevented, by the tonic contraction of this muscle, from passing farther backward. When infection of the posterior urethra does take place, it may be due to the infective secretion being carried backward by the use of instruments or injections, or perhaps more often by extension of the process beyond the external sphincter by continuity of tissue. The fact that the membranous urethra is almost devoid of glands or lacunæ might deter extension by the latter process.

As a result of the irritation set up by the growth of the gonococci in the urethra, inflammatory phenomena are manifested, the epithelium undergoes increased prolifer-

ation, desquamation may be even more rapid than proliferation, so that epithelial erosions may be abundant. They are chiefly found as minute, almost microscopic, ulcerations at the orifice of the lacunæ and glands of Littre. As a resultant of these changes the urethra is swollen, softened, and very vascular, and exudes from its free surface a profuse muco-purulent discharge, which varies in consistency and color according to the intensity of the inflammation and the predominance of the mucous or purulent element. The swollen condition of the mucous membrane diminishes its resiliency, and the stream of urine is smaller, while its passage over the inflamed and resisting urethra is painful to a degree that may be exquisite, especially if the urine is very acid. In very severe cases the act of urination may rupture some of the engorged capillaries, and be followed by the oozing of blood from the urethra.

Along the under surface of the urethra the inflamed glands of Littre may be felt as hard, shot-like bodies. Occasionally the orifices of these glands become occluded, and the contents, undergoing abscess formation, rupture either externally or into the urethra itself.

The prepuce is frequently œdematous, and on the dorsum of the penis the inflamed lymphatics may be felt as a hard cord. The inguinal glands above Poupart's ligament are usually somewhat swollen and tender, and in exceptional cases may undergo suppuration, either from the pyogenic properties of the gonococci, or, more probably, from a mixed infection, in which the staphylococci and streptococci play an important *rôle*.

The above description applies to acute gonorrhœa at its acme; but it must not be forgotten that the disease is a progressive one, and that its symptoms vary with the

intensity and duration of the inflammation. It will be necessary, therefore, in order to cover the ground to follow the clinical aspect of the disease from beginning to end.

At the onset of the disease it is only that portion of the urethra which comprises the meatus and fossa navicularis which is affected. Consequently, while there may be marked objective symptoms, the subjective symptoms are much less than at a later period, when the disease has traversed a greater area of the urethra. In the early stage the lips of the meatus are swollen and slightly everted, a little purulent discharge exudes on pressure from the follicles of the exposed part, but the total discharge from the urethra is slight. As the disease extends backward the amount of the discharge increases, sometimes to such an extent that it constantly trickles from the meatus. The discharge is now thick and creamy, and, in very severe cases, it may be of a greenish tinge. The disease gradually increases in intensity for about ten days, dating from its first appearance, by which time the gonococci have invaded the urethra as far as its bulbous portion, where, in uncomplicated cases, its progress is arrested. At this period the acme of the disease has been reached, and another epoch of about ten days is now entered upon in which the disease is stationary at its point of greatest intensity. During this period the whole anterior urethra is tender and swollen, and the discharge is thick and abundant. Constitutional symptoms may be present in the form of slight febrile disturbance, chilliness, and malaise. The patient is tortured at night by erections, which, besides aggravating the intensity of the inflammation, are exceedingly painful, more especially if the spongy tissue surrounding the urethra is infiltrated to such a degree as to prevent the filling of its lacunar

spaces and extension with the corpus cavernosum during erection, producing a downward curvature of the penis, to which the name chordee has been given. The period of greatest intensity of the inflammation is followed by a gradual decline in the intensity of all the symptoms. The discharge lessens in quantity and becomes less creamy, and the mucous element gradually predominates. The urethra becomes less tender, the pain in urination diminishes or disappears, and the stream of urine increases in size. In favorable cases, in from ten to fifteen days from the beginning of the period of decline the inflammatory symptoms will have subsided, with the exception of a hypersecretion of mucus, which may persist for one or two weeks as a clear, sticky fluid, which keeps the meatus unnaturally moist.

The above may be accepted as descriptive of the type of an acute uncomplicated attack of gonorrhœa. The symptoms may, however, be modified by the variability in the intensity or virulence of the disease, by previous attacks of gonorrhœa, by the presence of a constitutional diathesis or dyscrasia such as gout, rheumatism, tuberculosis, or syphilis; also by the habits and occupation of the patient, together with the modifications of the disease which may be produced by treatment, or the onset of any of the numerous complications which may at any moment alter the whole aspect of the case.

It is a question, therefore, whether there is such a thing as a typical gonorrhœa; or, to put it more specifically, which is typical, the complicated or the uncomplicated gonorrhœa?

Gonorrhœa has been described as a self-limited disease, and such is usually the case. To the question why it is self-limited we may reply, for the same reason that other

contagious diseases are limited, namely, the gonococci, by their continued growth in the same soil, deprive that soil of the materials essential to the maintenance of their pristine virility, and in the struggle for existence are unable to maintain a successful warfare against the urethral tissues.

One attack of gonorrhœa, however, offers no barrier to subsequent attacks, although they are rarely as severe as the primary attack, but are more liable to be followed by unpleasant sequelæ.

In some attacks of gonorrhœa the symptoms are never acute at any time, and may be classed as subacute from the outset. In these cases it is reasonable to suppose that the original infection is either weak from long-continued propagation of successive generations of the gonococci in the mucous membrane of the vagina, and does not regain its virility on transplantation to a new culture field; or else that the latter, perhaps from previous attacks of inflammation, offers but a poor medium for the growth of the micro-organism.

Doubtless many of the cases of so-called simple urethritis, which in the older works were attributed to having connection with a female who has a leucorrhœa, or has not ceased to menstruate, would come within this catagory of subacute gonorrhœa.

It is unnecessary to enter into the symptoms and course of this variety of gonorrhœa. Suffice it to say that it is simply a milder grade than the acute, not only in the duration of the attack, but also in the character of the discharge and general course of the disease. The microscopical demonstration of the gonococci in the discharge would establish the diagnosis, and should be used in case of doubt.

It should not be forgotten, however, that some attacks of urethritis are not due to the gonococci, but to other pyogenic micro-organisms, which are less irritating to the urethral mucosa, and are therefore associated with milder symptoms, and might be classed as subacute from the beginning, although some of these cases pursue a protracted course.

A few words may with advantage be said at this stage on acute urethritis not due to parasitic causes. A typical illustration of this is sometimes seen where the urethra is swabbed or injected with a strong solution of nitrate of silver to abort a dreaded attack of gonorrhœa. In these cases there is no period of incubation, and the acme is reached in a few hours at the utmost, after which, without the intervention of a stationary period, the inflammatory symptoms steadily subside; resolution being complete in a few days; and, unlike gonorrhœa, never lapses into the chronic stage. The absence of an incubation period and the brief duration of the disease, together with the history of a mechanical or chemical irritant that immediately preceded the attack, will readily differentiate this disease from true gonorrhœa. It may be more difficult, however, to determine whether the attack may not be an exacerbation of a latent gonorrhœa, roused into activity by a local irritant. In some cases this can only be determined by a demonstration of the presence or absence of the gonococci.

CHAPTER IV.

ACUTE ANTERIOR URETHRITIS.

Treatment.

It must be admitted there has been less progress, in recent years, in the treatment of acute urethritis than in any other department of urethral surgery. This has certainly not been due to a lack of effort on the part of the profession, for they have displayed a most restless activity in this line of work, and a review of the literature of the subject would be, to say the least, herculean. Almost every worker, and some that are not workers, in urethral surgery, has at one time or other discovered a specific, for which not infrequently preposterous claims have been based on the experience of one or two cases.

It would seem as if gonorrhœa was constantly on the verge of being shorn of its terrors and reduced, if not to innocuous desuetude, at least to a par with the proverbial cold. But frankly speaking, of all the specifics that have been from time to time introduced with a hurrah, not one has stood the test of time and experience, and the treatment of this malady is simply where our fathers left it.

We have learned by bitter experience to be more conservative than formerly. We are less prone to adopt

heroic methods of treatment, and we probably realize more fully the treacherous nature of this disease; how it may at any moment strike off at a tangent and lead us into the gravest of situations; and we have come, therefore, to respect it accordingly. In this there is a distinct advance, but it is a passive, not an aggressive one.

In the following pages the writer has nothing new to suggest, and simply states what his own experience, backed up by that of conservative writers on the subject, warrant him in giving as the safest and most satisfactory method of treatment. This may serve to explain the apparent incompleteness and also the dogmatic tone of this chapter, both of which are necessary in order to steer clear of the pitfalls of verbosity and vagueness which often ensnare a writer on a subject on which so much literature has been wasted.

In the treatment of an acute gonorrhœa the physician should strengthen his position by impressing on the patient the necessity of conforming to the rules laid down to govern his conduct, and the care of his urethra; and also to impress upon him the uncertainty and treacherous nature of the disease. He should not permit either himself or his patient to look lightly upon it, for the simplest case may prove most intractable to treatment, or be followed by the most troublesome complications.

The treatment of acute urethritis is hygienic, dietetic, and therapeutic. The following fundamental rules should form the basis of treatment in all cases. A life of repose or abstinence from extreme muscular exertion should be advocated. If a patient would only consent to remain in bed he would be under the best possible con-

ditions for recovery; but it would be unreasonable to ask him to submit to confinement during an uncomplicated attack of gonorrhœa; besides, motives of secrecy would usually interpose an effectual barrier to such a proceeding. However, he should avoid unnecessary exertion or exposure; he should keep regular hours, retire early, and avoid all female society that might tend to produce erotic feelings.

A non-stimulating diet should be followed. By this is meant the avoidance of highly seasoned food, which is liable to excite the sexual organs. Tea and coffee should be used but sparingly, but their total elimination I do not think either necessary or advisable. Bland liquids, such as milk or water, should be drunk freely, in order to dilute and render the urine less irritating to the inflamed urethra.

Alcoholic drinks in any form should be forbidden.

This is all-important and must be carried out to the letter if we desire to obtain the best results. If it is impossible to totally abstain from alcoholic drinks, the only thing permissible would be to take a glass, and the more seldom the better, of the dark or red wines, as the astringent principle in these wines serves to counteract their irritating properties. Many patients fancy that they may indulge in beer because of the scantiness of its alcoholic constituents, but it has been my experience that this is the very worst drink that a patient with a gonorrhœa can take, and its use should be rigorously tabooed.

The bowels should be regulated. Constipation and diarrhœa are each injurious. Absolute cleanliness of the genital organs by frequent ablutions should be enforced. The hands should be carefully washed after touching the

parts, and infection of the eyes carefully guarded against, otherwise the results may be disastrous.

The therapeutic treatment of gonorrhœa may be divided into two classes of remedies, first those that are administered by mouth, and second, those that are applied directly to the inflamed urethra by injections.

The first class may be in turn subdivided into two groups, namely, those such as the alkalies that have only a local action, by rendering the urine unirritating in its passage through the urethra, and those, such as the fixed and ethereal oils, which seem to have a twofold action, first by impregnating the urine and thereby exerting a local action on the urethra during urination, and second, by a direct or specific action on the mucous membrane. It has been shown that injections of the latter group of remedies have a beneficial influence on the inflammatory process, but are not as efficacious in this way as by internal administration, from which it may be inferred that these remedies exert a beneficial influence on the inflamed urethra, not only while passing in the urine, but also before their elimination, while circulating in the tissues of the urethra.

To the first group of remedies belong the alkalies, which act by directly neutralizing the acidity of the urine. The alkalies in most common use are the citrate of potassium, the bicarbonate of potassium, and liquor potassæ. The writer frequently uses a tablet containing potassium and sodium bicarbonate, each five grains, one tablet to be taken every two hours until the urine is nearly neutral in reaction. The alkali should not be administered immediately after or before a meal as digestion may be interfered with in so doing. Nor should the

remedy be pushed to the point of making the urine distinctly alkaline, as such urine is of itself irritating and may precipitate phosphatic crystals that act as a mechanical irritant in its passage through the urethra.

To the same class of remedies belong diluents, which tend to render the urine, by diluting it, less irritating to the urethra.

The representatives of the second group of remedies are sandal-wood oil, copaiba, and cubeb. Sandal-wood oil is probably the most elegant preparation, as it is less liable to nauseate than the others. The great objection to it is its cost, and the consequent liability to adulteration.

Copaiba is the remedy in most general use. It is just as efficacious as any other, and its cheapness is a guarantee of its purity. It will, however, in some cases produce an aching over the kidneys, and occasionally a transient albuminuria. In this relation it should be borne in mind that copaiba is eliminated in the urine as sodium copaivate, and on the addition of a mineral acid to the urine the copaiba is liberated from the soda and precipitated as copaivic acid, which forms a whitish flocculent precipitate soluble in an excess of the acid, and may be readily mistaken for albumin. Copaiba will also in some cases produce an erythematous eruption that may be the cause of considerable alarm to the patient. The eruption, however, is harmless, and will rapidly subside on the withdrawal of the remedy.

Cubeb is in less repute than sandal-wood or copaiba, but it is still frequently used in powder, fifteen to fifty grains at a dose, or in combination with one or other of the remedies already mentioned.

Subjoined are given some of the most popular combinations of these remedies:

LAFAYETTE MIXTURE.

1.

℞. Copaibæ,
Spiritus lavendulæ compositi,
Spiritus ætheris nitrosi,
Liquoris potassæ.....āā f ℥ ss.
Olei gaultheriæ..... f ʒ ij.
Mucilaginis acaciæ..... f ℥ vj.
M.—Sig.: One to two teaspoonfuls three times a day, after meals.

A modification of the above, one that I frequently use, is as follows:

2.

℞. Copaibæ..... f ʒ vj.
Liquoris potassæ..... f ʒ iv.
Olei gaultheriæ..... f ʒ j.
Extractum glycyrrhizæ..... ʒ ij.
Mucilaginis acaciæ, q. s. ad..... ℥ vj.
M.—Sig.: Two-drachm dose to be taken two hours after meals.

3.

℞. Olei santali..... f ℥ ss.
Olei menth. pip..... gtt. viij.
M.—Sig.: Fifteen to twenty drops to be taken after meals.

4.

℞. Pulveris cubebæ,
Copaibæ.....āā f ℥ ss.
Acaciæ..... ʒ ij.
Aquæ cinnamomi..... f ℥ iv.
Syr. aurantii cort..... f ℥ j.
M.—Sig.: One-drachm dose to be taken after meals.

Dr. J. William White speaks very highly of salol in the treatment of acute urethritis, and recommends the following formula given in capsules: Salol, 5 gr.; oleoresin of cubebs, 5 gr.; Para balsam of copaiba, 10 gr.; pepsin, 1 gr. He says further: "While I do not think

that 'complete cures' are often obtained by internal remedies alone, I have become entirely convinced that the administration of this capsule is of great benefit in reducing both the severity and duration of infectious urethritis, and of lessening the frequency of occurrence of posterior urethritis and its complications."

It is unnecessary to pursue this line of prescribing farther. The combinations are infinite, and the reader may be safely left to modify or add to them as he sees fit. Any or all of them may prove disappointing, and the best of them are unpalatable. It would seem as if Nature had purposely punished the sin of venery by furnishing only the most nauseating drugs for its relief.

The local treatment consists in the use of injections. An instrument should never be passed along the acutely inflamed urethra unless it is for the relief of a greater evil, such as retention of urine or the treatment of an inflamed posterior urethra, which may be necessary in order to relieve vesical tenesmus.

While there is a fairly uniform sentiment among physicians that the internal administration of remedies should be begun as soon as a gonorrhœa is recognized, there is still the greatest diversity of opinion not only as to the value of urethral injections, but, to a still greater extent, as to the proper time to use them. Some decry their use at any period; others insist on their use from the beginning of the disease, but the majority of urethral surgeons, the writer among the number, advise that the use of injections be deferred until the declining period of the disease has been reached.

When it was proven that gonorrhœa was caused by a parasitic growth in the urethra, a host of surgeons adopted the use of antiseptic irrigation, and much injury

was done by the use of bichloride of mercury solutions, ranging in strength from 1 to 1,000 to 1 to 5,000. Subsequently weaker solutions, 1 to 15,000 to 1 to 30,000 were, and are still employed, an apparatus such as is shown in Fig. 11 being used. A few still claim that the disease is materially shortened by this plan of treatment, which promised so much in theory but accomplished so little in results. There are potent reasons why antiseptic solutions do not exterminate the gonococci. First, the remedy cannot be used in sufficient strength, on account of its irritating properties, to have much germicidal action; and second, the gonococci have the power of burrowing out of reach, as it were, of the antiseptic solution, which, if sufficiently strong to be germicidal, coagulates the albumin on the surface of the urethra, which interposes an effectual barrier to the deeper penetration of the injection. In addition to this the treatment is troublesome, requiring frequent irrigation of the urethra, and judged from the stand-point of results it scarcely repays



FIG. 11.—Irrigation Apparatus.

for the trouble it entails. Besides, it is a method of treatment that is prone to be followed by posterior urethritis, with its unfortunate sequelæ of cystitis, epididymitis, etc.

As has already been stated, it is the firm conviction of the writer, and in this he voices the sentiments of the majority of urethral surgeons, that injections should not be used in the treatment of acute gonorrhœa until the period of decline of the disease has been entered upon. At this period the gonococci have reached their farthest limits along the urethra, therefore the injection will not likely be the means of propagating the disease by washing the micro-organisms backward. Besides, the period is now entered upon when the urethral tissues begin to exercise their supremacy over the gonococci, which are forced to the free surface where they may be advantageously attacked.

The technique of injecting is of some importance. A syringe, such as is shown in Fig. 12, capable of containing half an ounce, should be used. The nozzle should be bluntly tapered so as to block the orifice of the urethra. Before injecting, the patient should urinate in order to cleanse his urethra. The syringe, filled with the injection, should be inserted into the meatus so as to



Fig. 12.—Injection Syringe.

block the return of the fluid. The injection should be gradually forced into the urethra until a feeling of distention is experienced, similar to that felt on suddenly blocking the stream during urination. The syringe

should then be withdrawn, and the injection retained for from two to three minutes. The injection may be repeated as often as is considered advisable, but no injection should pain or burn for a longer period than ten minutes.

The number of injections in common use are multitudinous, and it would be a work of supererogation to attempt to enumerate them, as the list would be interminable and their combinations infinite. Almost every physician, and for that matter many of the laity, have their own favorite injections. The following are given by the writer, not necessarily as the best, but as the ones from which he has obtained the most satisfactory results:

1.

℞. Extracti hydrastis fluidi..... f ʒ j.
Zinci sulphatis..... gr. xx.
Morphinæ sulphatis..... gr. iij.
Aquæ rosæ, q. s. ad..... f ʒ vj.

2.

℞. Zinci sulphatis,
Ferri sulphatis,
Alumini sulphatis.....āā. gr. xij.
Cupri sulphatis..... gr. vj.
Aquæ destillatæ, q. s. ad..... f ʒ vj.

3.

℞. Zinci sulphatis..... gr. xv.
Plumbi acetatis..... gr. xxx.
Aquæ rosæ..... f ʒ vj.
Tincturæ catechu,
Tincturæ opii.....āā. f ʒ j.

4.

℞. Zinci sulphatis,
Aluminis pulveris.....āā. gr. xij.
Acidi carbolici..... gr. iv.
Aquæ destillatæ, q. s. ad..... f ʒ vj.

5.

℞. Potassii permanganatis..... gr. iv.
Aquæ destillatæ, q. s. ad..... f ℥ vj.

6.

℞. Argenti nitratis..... gr. iij.
Aquæ destillatæ, q. s. ad..... f ℥ vj.

7.

℞. Zinci sulphocarbolatis..... gr. xxiv.
Aquæ destillatæ, q. s. ad..... f ℥ vj.

8.

℞. Hydrarg. chlor. corrosivi..... gr. $\frac{1}{6}$.
Zinci sulphocarbolat..... ʒ ss.
Acid. boric..... ʒ ij.
Acid. carbolic..... f ʒ ¼.
Boroglyceride (twenty-five per cent.)..... f ℥ ij.
Aquæ destillat..... f ℥ iv.

Sig.: Use locally; dilute if painful. "Useful as the first injection in the beginning of the stationary period."—Dr. J. William White.

The multitudinosity of the injections in common use is proof positive that none of them are always efficacious. I have often, in my own practice, observed the progress of a gonorrhœa untreated by injections, at any period of its course, and frequently found it to compare favorably with cases where I have used injections freely. I do not attempt to decry the use of injections in acute gonorrhœa, but simply state that there are cases of gonorrhœa that do just as well without them. On the other hand, the contrary more often holds good, and the physician himself can be the only judge of what to do in any particular case.

When the erections are troublesome, especially if pollutions are frequent, they seriously hinder the favorable progress of the disease, and treatment should be directed to control them.

Lupulin and the bromides are the most efficacious remedies at our disposal. The following prescriptions will usually be satisfactory:

1.

℞. Potassii bromidi..... ʒ j.
Aquæ camphoræ..... f ʒ iv.
M.—Sig.: A tablespoonful to be taken at bedtime.

2.

℞. Lupulini..... gr. xx.
Morphinæ sulphatis..... gr. jss.
M.—Ft. capsulas, No. 10. Sig.: One capsule to be taken night and morning.

It would be well for the patient to sleep on a hard bed, and with scanty clothing; also to bathe his penis in warm water before retiring, and with the onset of erections to get up and urinate.

In my own practice the routine treatment of an uncomplicated case of gonorrhœa is usually as follows: The patient is first instructed concerning the hygienic and dietetic rules he is to follow as indicated in this article. He is advised to drink liquids freely, the alkaline mineral waters, such as Vichy or Bethesda, are recommended, and the evils of alcoholic drinks are explained to him. He is ordered to wear a suspensory bandage with a gonorrhœal bag attachment (Fig. 13), which can be procured at any drug-store. He is then given a prescription containing

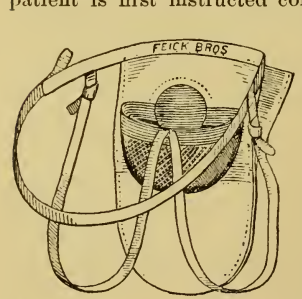


Fig. 13.—Suspensory with Gonorrhœal Bag-attachment.

copaiba, preferably a modification of the Lafayette mixture (No. 2); also a prescription for a drachm dose of bromide of potassium in camphor water, to be taken at bedtime, if necessary, to control erections.

If the patient bears the medicine well, he is kept on it until the stage of decline is well established. If his stomach rebels against the medicine a simple alkaline mixture is substituted, and in addition capsules of sandal-wood-oil may be given. In the stage of decline, under any circumstances, I simply use an alkaline mixture, or give the alkaline mixture between meals and the copaiba mixture at bedtime. If the case does well under this treatment injections are withheld until I am dissatisfied with the progress of the case. Then I usually try Ricord's injection (No. 3), substituting some of the others if I see fit. If the gonorrhœa under this treatment becomes stationary, without pain and with but little discharge, I use weak injections of nitrate of silver (No. 6), or else pass, for a few times at intervals of three days, one or two full-sized sounds that have been cooled in ice-water before introduction. In case this failed to effect a cure I would be inclined to abandon all treatment for a time. Its resumption, if necessary, would come under the treatment of chronic urethritis. *The cure of gonorrhœa is often delayed by over-anxiety, or over-activity in its treatment, and will often progress more favorably if permitted for a time to pursue its own course toward recovery.*

A few words may here be said on the abortive treatment of gonorrhœa, which was formerly so much vaunted. This method has been thoroughly tried and found wanting, and is but little in vogue nowadays. Ill results are oftener met with in its use than beneficial ones, and the conservative physician will scarcely of his own accord

advise a treatment that will in all probability fail of its object, and by aggravating the course of the malady bring down the censure of the patient. Even if used at the urgent solicitation of the patient, it should only be done under protest, and with a full recognition by the patient that he must assume all responsibility for the result.

The method in common use is one or more strong injections, of nitrate of silver, ten or thirty grains to the ounce. This is always followed by a marked inflammatory reaction ; but in some cases the disease is shortened or possibly aborted. The pain of such an injection may be mitigated by injecting a week saline solution, or by directing the patient to urinate. A better plan is to insert an endoscopic tube, thoroughly cleanse the mucous membrane, and swab its surface with a solution of nitrate of silver, thirty to sixty grains to the ounce. Strong injections of bichloride of mercury have been used to abort a gonorrhœa, but its use for this purpose is now abandoned. The physician will steer clear of many rocks if he avoids the abortive treatment of gonorrhœa.

It is a common supposition that injections, especially if strong, will produce stricture. Such has not been the experience of the writer, nor can I see how a stricture will follow an injection unless we can conceive of its being strong enough to devitalize a portion of the urethral mucous membrane, when a traumatic stricture might result from the formation of cicatricial material in the reparative process.

CHAPTER V.

CHRONIC ANTERIOR URETHRITIS.

Etiology.

Chronic inflammation of the urethral canal differs from the acute form of the disease chiefly in that it is of a lesser degree of intensity, and that it shows a greater tendency to become localized to certain areas in the urethra, which, at the parts affected, undergo structural changes, having but scant inherent tendency to return to a normal condition. The antecedent history and chief etiological factor in the production of chronic anterior urethritis is usually that of an acute anterior urethritis or gonorrhœa, and the more intense it has been, the greater the tendency to the formation of chronic lesions. Simple urethritis, such as may be caused by a strong injection, irritates the urethra to a lesser extent than a specific or gonorrhœal urethritis, and is a much less important factor in the production of chronic urethral diseases.

Not infrequently we see cases of urethritis that are subacute or chronic from the beginning, and frequently pursue an obstinate course. Many of these cases are in urethræ that have already suffered from attacks of gonorrhœa, and in these cases we may infer that the gonococci implanted in a urethra which had previously been the culture-field for previous generations of gonococci are

unable to find sufficient pabulum for a vigorous growth. In other cases where there has been no antecedent gonorrhœa it may be presumed that the gonococci, from long-continued growth in the previous culture-field, have but little virility ; or else we may presume that the inflammation is due to some other less virulent micro-organism, or to syphilis, tuberculosis, or some such cachectic condition.

An acute urethritis may be said to have passed into the chronic stage when, after the lapse of sufficient time for the subsidence of the disease under ordinary circumstances, the discharge does not cease, but exists as a scant, thin, muco-purulent discharge. This may appear as the morning-drop, or there may only be a stickiness, with adhesion of the lips of the meatus, or the patient may be only able to detect an abnormal secretion by the pernicious practice of milking or stripping his urethra.

An interesting problem for solution is why an acute urethritis which is due to an infectious process does not end in spontaneous recovery. Why is it that in some cases the gonococci disappear and the infectious process terminates within definite limits (four to six weeks), while in others the process may be continued in a chronic form indefinitely, and its infectiousness retained for a prolonged period? In attempting to answer this question we must bear in mind that there is a continual warfare going on between the gonococci and the urethral tissues, and the result is simply a question of the survival of the strongest. In the early stage of the contest the gonococci have the advantage because they are transplanted upon a fresh culture-medium, where the conditions are favorable to their growth. As the disease progresses the repeated propagation of the gonococci,

through successive generations in the same culture-field, weakens their vitality, and the balance of power is turned in favor of the urethral tissues. At the same time the symptoms of the disease diminish in intensity, and terminate with the ultimate extermination of the micro-organism.

It will be seen, therefore, that any factor which lowers the vitality of the urethral tissues diminishes its power of antagonizing the gonococci, and predisposes to the prolongation of the disease. Prominent among these factors are, in the order of their importance, intemperance, sexual indulgence, violent or prolonged exertion, exposure to sudden climatic changes, and a constitutional diathesis or cachexia, such as syphilis, tuberculosis, gout, and rheumatism.

In some cases the acute disease will pass into the chronic stage where none of these predisposing factors can be determined as being present. It will usually be found in such cases that the patients are subject to catarrhal affections ; that the mucous membranes of the body, the urethra included, are peculiarly susceptible to the inroads of disease, and exhibit a corresponding tardiness in returning to a healthy condition.

Chronic urethritis is, as a rule, limited to certain well-defined areas, the remainder of the urethra being usually in a healthy condition, except, when from an exacerbation of the existing inflammatory disturbance, the secretion from the inflamed areas, pouring over the otherwise healthy urethra, sets up a catarrhal inflammation in the latter.

It is difficult to explain why certain areas of the urethra should undergo complete and prompt recovery from a gonorrhœal inflammation, while a contiguous area, ana-

tomically identical, and endowed, as far as we can judge, with equal resisting power to the invasion and growth of the gonococci, should nevertheless become the permanent habitat of the latter, and undergo, as a result, structural changes to which the healthy areas are exempt. In the present status of the pathology of chronic urethritis this problem cannot be solved in a perfectly satisfactory manner.

It is a matter of common observation that chronic inflammations of the urethra are most often found in the deeper portions of the canal, so that we may state, as a general rule, to which of course there are many exceptions, that the nearer to the vesical orifice of the urethra the greater the liability to the presence of chronic lesions. When we consider that the proximal portion of the urethra is the part first and often most severely affected in acute inflammations, and also that it is liable to be bathed in the secretions of the distal portions of the anterior urethra, the reverse of which does not hold true, it may seem curious that chronic inflammations are least liable to be found in this situation. The frequent localization of the inflammatory process in the bulbous urethra has been variously attributed to imperfect drainage, owing to its more or less horizontal position and the consequent liability to infiltration of its walls. It has also been compared to a suppurating pouch, probably under the supposition that in gonorrhœa the secretions accumulate and distend this very dilatable portion of the canal.

We can scarcely accept either of the above hypotheses as correct when we consider that this portion of the urethra is surrounded by a special muscle, the ejaculator urinæ, for the purpose of emptying the canal, at the same time it draws attention to the fact that the muscular irri-

tability of the part, by disturbing its quiescence, may be a factor in the prolongation of the inflammatory process. There are other reasons, however, that may better serve to explain this phenomena, namely, the difficulty that attends, from its situation, the local treatment by injections of this portion of the urethra, and also, what is of more importance, it is the bulbous part of the urethra that is most freely supplied by glands and lacunæ in which the gonorrhœal process is so prone to lurk. This is supported by the fact that the membranous portion is very poorly supplied by these diverticulæ, and it is also very little liable to become the seat of chronic inflammatory lesions.

The frequency of chronic inflammation in the posterior urethra will be explained in the chapter devoted to its diseases, and need not be entered into here.

CHAPTER VI.

CHRONIC ANTERIOR URETHRITIS.

Pathology.

A PROPER understanding of the pathological changes in chronic urethritis is indispensable not only as the basis on which to form a guide to the rational treatment of the disease, but also on account of its bearing in determining the disputed relationship between stricture and gleet.

The pathology of chronic urethritis is so intimately associated with the pathology and formation of stricture, and must overlap each other to such an extent, if a separate description were given, that no attempt will be made to divorce them. Much, therefore, of the following must be considered as applying more directly to stricture than to chronic urethritis, and will be subsequently utilized in the consideration of stricture.

To Finger, of Vienna, belongs the credit of placing the pathology of this disease on an accurate and scientific basis. His post-mortem macroscopical and microscopical examinations of numerous cases of chronic urethritis have such an important bearing on the subject that I will quote freely from his work as follows:*

"The hyperæmia, serous swelling, and infiltration, which are observed with the endoscope so often during

* Blennorrhœa of the Sexual Organs, by Ernst Finger. Third edition, page 171 *et seq.*, Anatomo-pathological Changes of the Pars Anterior.

life, either disappear post mortem or become less recognizable.

"There are, however, numerous macroscopic changes. The epithelium exhibits changes which vary from slight opacity to considerable thickening and whitish discoloration; the latter condition often simulates superficial cicatrices. Losses of epithelium are much rarer than thickenings and are usually superficial and isolated. *I never found extensive erosions or ulcerations.*

"The changes in the subepithelial tissue, the swelling and infiltration which depend upon hyperæmia, are indistinct on account of the disappearance of the hyperæmia. Only one group of cases exhibited changes of the surface which were due to swelling. In circumscribed spots the surface appeared finely ridged, uneven, containing small nodules, whose size varied somewhat. These were undoubtedly granulations, as was shown by the microscopical examination.

"There were striking changes in Morgagni's lacunæ. On section of the normal urethra these are invisible, or appear as very fine dots. In a series of cases of chronic urethritis the openings are as large as the head of a pin, and with the surrounding parts may be elevated like a crater. In another group of cases the lacunæ are absent, and they are replaced by milky-white nodules which are embedded in the mucosa.

"With the unaided eye it is often impossible to distinguish cicatrices from simple epithelial thickenings. This is particularly true of ridge- and net-shaped, slightly elevated strictures, which are formed in part by the epithelium, in part by subepithelial connective tissues.

"Non-constricting, depressed, eccentrically retracted callosities are not infrequent. Examination shows that they are always very superficial and due to changes in the uppermost layers of the subepithelial tissue.

"There are numerous interesting microscopical changes. In a series of cases the epithelium still retains its normal arrangement, but the uppermost layer of cylindrical cells is loosened and in a condition of mucoid degeneration.

The transition cells, consisting normally of one or two rows, are often spread over many rows. Numerous pus corpuscles are embedded between the cylindrical and transition cells. Another interesting change is the transition of cylindrical into pavement epithelium. Three types of pavement cells may be distinguished:

"(*a*) It resembles that of mucous membranes with pavement epithelium—*i.e.*, it consists of an undermost layer of cubical cells, several layers of polygonal cells, and an upper layer of pavement epithelium.

"(*b*) The epithelium is epidermoidal, consists of a lower layer of cubical cells, followed by several layers of polygonal or spindle-shaped cells analogous to the rete Malpighii; these cells constantly grow larger and flatter toward the surface.

"(*c*) The epithelium is like that over cicatrices, and consists of several layers of very flat pavement epithelium.

"This conversion of cylindrical into pavement epithelium, which causes a xerosis of the mucous membrane, is connected with the changes in the subepithelial connective tissue. Thus the first type of cells is found over recent round-celled infiltration, the second type over older ones, the third form over firm connective tissue.

"The subepithelial connective tissue exhibits the most important changes, and is the site of the chronic inflammatory process proper. This consists of an infiltration of the connective tissue, which has a decided tendency to transformation into retracting connective tissue. In the more recent cases we find that the subepithelial connective tissue, sometimes only in the upper layers, sometimes extending even into the corpus cavernosum, contains a loose or dense infiltration, consisting of mononuclear and epithelioidal cells, sometimes mixed with pus cells. This infiltration surrounds the lacunæ and glands embedded in the subepithelioidal tissue; hence it is also perilacunar and periglandular.

"In a group of cases the cellular infiltration contains numerous, evidently new-formed, very wide blood-vessels.

These two factors—viz., the infiltration and the blood-vessels—give to the subepithelial connective tissue that papillomatous appearance, that mulberry-like condition of the mucous membrane in places which we described as granulations. The infiltration consists of round and epithelioidal cells; as it grows older the spindle cells become more abundant, the interfibrillary tissues become denser and firmer, and there finally results a tissue which resembles a cicatrix anatomically. It is not due to ulceration, but to chronic connective-tissue hyperplasia. The granulations which may have formed during the recent stage are flattened by the retraction, and a callosity results. This corresponds to the infiltration of the first stage; it is always circumscribed, sometimes located superficially in the uppermost layers of the subepithelial connective tissue, sometimes it extends deeply, even into the corpus cavernosum.

"The stage of infiltration and cicatrization may be complicated temporarily by exacerbation of acute inflammation and emigration of leucocytes.

"The lacunæ exhibit changes analogous to those in the mucous membrane. The epithelium shows desquamation of the cylindrical cells, proliferation of the transition cells, transformation into pavement epithelium. The infiltration in the perilacunar tissues often raises the lacunæ and dilates their lumen. If the infiltration in the connective tissues retracts, the lacunæ will become atrophic and disappear. Not infrequently the outlet is first narrowed, and the lacunæ is then converted into a little cyst filled with pavement epithelium.

"Littre's glands, which are situated in the meshwork of the corpus cavernosum, exhibit two kinds of changes. In one the change is periglandular; the small-celled infiltration of the subepithelial connective tissue around the excretory ducts of the glands draws them downward and surrounds the glands and its duct. The excretory duct also exhibits epithelial changes which imitate those found upon the free surface, viz., the three types described above. Special interest attaches to the second

type, in which the epithelium resembles that of the rete Malpighii. This is developed excessively in the excretory ducts, even extends into the body of the gland, pushes beneath the secreting glandular epithelium and leads by compression to destruction of the acini. The secreting epithelium merely exhibits passive changes, viz., destruction by the periglandular infiltration, which penetrates into the net-work of the acini.

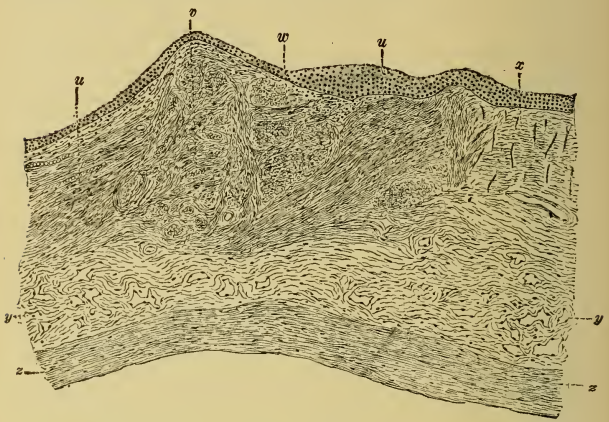


FIG. 14.—Section through a Stricture, the Connective-tissue being so firm as to resemble cicatricial tissue. (Taylor.)

"Exacerbations of acute inflammation, with emigration of pus corpuscles, can also be demonstrated in the glands and their excretory ducts.

"In a number of cases the corpus cavernosum is entirely intact. It may also take part in two ways in the chronic inflammatory process.

"In one series of cases the chronic infiltration remains in the main superficial. It only enters the corpus cavernosum along the excretory duct and around the bodies of Littre's glands. This periglandular infiltration compresses not only the glands, but the adjacent spaces of

the corpus cavernosum are also drawn into the retraction. The corpus cavernosum then appears to be traversed by an entire series of cicatricial connective-tissue bands.

"In another series of cases the chronic infiltration, which occupies the entire thickness of subepithelial periurethral tissue, also penetrates the corpus cavernosum; here it remains superficial or occupies its entire width. In the first stage of the small-celled infiltration the trabeculæ of the corpus cavernosum appear enlarged and infiltrated with numerous round (later spindle) cells. If this infiltration, which is always circumscribed, undergoes retraction the mucosa and corpus cavernosum are converted into a firm, retracting callosity. These deep-spreading callosities are the causes of stricture.

"Wasserman and Halle (1891) have confirmed these findings, and we are therefore warranted in defining stricture as the result of chronic cirrhotic periurethritis and cavernitis, which complicate chronic urethritis.

"Hence we must distinguish in the pars anterior two forms of the chronic process: a purely mucous, superficial form, which results in superficial non-constricting, eccentrically retracting cicatrices; and a second form, in which the process extends to the periurethral tissue and corpus cavernosum, and thus leads to stricture."

On page 144 of the same work there appears the following:

"So long as the process remains localized in the mucous membrane these are the symptoms which may persist for years. *That such a chronic urethritis, situated solely in the mucous membrane, may heal as the result of recovery of the spot of infiltration by the formation of connective tissue and superficial cicatrices I have proved by post-mortem examination. When the process extends to the submucous tissue, to the corpus cavernosum, and the chronic infiltration heals by the formation of retracting connective tissue, a new and gradually developing symptom of*

a more serious significance is added to the clinical history, viz., narrowing or stricture."

The pathology of chronic urethritis, as portrayed by Finger, sheds considerable light on the formation of stricture. Many questions remain unanswered, and there is still much that is obscure, but the recent advances in this line of study are most encouraging and give promise that urethral pathology will soon be established on a scientific basis. The chief point of interest that the subject has is the relationship of granular urethritis to stricture. An effort will be made to prove that granular urethritis is not only the forerunner, but the prime etiological factor, in the production of the great majority of strictures of the urethra; and by the same proof to demonstrate the fallacy of the theory, so generally accepted, that stricture bears a relationship to gleet of cause and effect.

It will be necessary, however, to enter somewhat in detail into the subject of granulations, and also, in so doing, avail ourselves of the results of investigations, not only in the urethra but also in the conjunctiva, where we frequently find a similar condition present, and where the disease is easily studied, and since the well-known course of the latter will be utilized to corroborate the statements concerning the less-known course of the former, it may be advisable to establish their relationship at the outset.

A granular urethritis is the result of a gonorrhœal infection of the urethra. This is so well recognized that it is no longer a subject for discussion, and may therefore be passed over without further mention. On the other hand, a granular conjunctivitis is, in the vast majority of instances, derived by contact with a similar case of gran-

ular conjunctivitis. It is well known that a single individual with this disease may infect a whole community, as is sometimes witnessed in asylums, schools, and barracks. A case of granular conjunctivitis always gives rise by transmission to a similar conjunctivitis, but it is now generally recognized that this it not the only source of the malady, for it has been shown that a gonorrhœal conjunctivitis may be followed, as in the urethra, by the formation of granulations, which in its turn may perpetuate the latter disease.

The following extract bearing on this subject is from Dr. Ernst Fuch's "Text-book of Ophthalmology," page 77 *et seq.*:

"Does any connection exist between trachoma and acute blennorrhœa?

"These two diseases, which both originate in infection, are, of course, in their typical form, very different from each other. Nevertheless, the chronic blennorrhœa which develops from an acute blennorrhœa is so similar to the papillary form of trachoma that these two cannot be distinguished from each other with certainty, either by the clinical examination of the eye or by anatomical dissection.

"We may advance the following hypothesis: Recent acute blennorrhœa when transferred to another eye produces blennorrhœa in the latter also. But if the acute blennorrhœa has already passed into the chronic form, its transfer to another eye is no longer an acute but a chronic inflammation, which latter is trachoma. Different observations speak for the possibility of such a method of origin of trachoma. Goldzieher reports an epidemic of trachoma in the school for the blind at Budapest, an epidemic which had been introduced by a new-comer, a boy who had lost his sight from acute blennorrhœa. Through him all the male and most of the female scholars became affected with trachoma, all possible forms of which, in-

cluding the pure papillary, the pure granular, and the mixed, could be recognized."

Sattler has observed the following case:

"A mother, who was affected with leucorrhœa, gave birth to a child having acute blennorrhœa of moderate degree. The mother acquired a genuine trachoma by infection from her child. As she lived in a region perfectly free from trachoma, infection from any other source was excluded. Against such a connection between chronic blennorrhœa, following the acute form, and trachoma, the objection has been raised that in the former disease granulations (lymphatic follicles) have never been observed. But this is not always the case. In the autumn of 1887 two girls, sisters, were admitted to my clinic, the elder of whom had acquired an acute blennorrhœa of the conjunctiva of both eyes as a consequence of her own leucorrhœa. The younger sister had caught the infection from the eyes of the elder, and likewise acquired acute blennorrhœa of both eyes. In her case this was not quite so severe in its onset, and, after the greatest violence of the inflammation had abated, papillary outgrowths developed in the conjunctiva tarsi, and numerous granulations in the folds of transition, so that there was presented a perfect picture of mixed trachoma.

"In many other cases besides this I have been able to observe the development of granulations in the folds of transition after acute blennorrhœa, and still more frequently have been able to prove their existence by the microscopical examination of excised portions of the conjunctiva.

"From what has preceded we may draw the following conclusions: There is but one kind of trachoma, which, however, appears under various forms. The ultimate origin of the disease is probably referable to the secretion of genitals affected with gonorrhœa. This secretion produces in the human conjunctiva acute blennorrhœa, which passes into chronic blennorrhœa. The secretion

of the latter produces in a healthy eye directly a chronic inflammation, trachoma, which then by a repeated process of transfer spreads of itself."

The first manifestation of a granular urethritis is a round-celled infiltration of the subepithelial tissues. This infiltration may be limited to the mucous membrane or it may penetrate deeper, invading the submucous and cavernous tissue. The infiltrating cells tend to become heaped in clumps directly under the epithelium. New blood-vessels penetrate the infiltration, ramifying in the subepithelial clumps, giving to the urethra so affected the florid, papillary appearance so characteristic of granulations.

At a later stage the infiltrating cells become transformed into spindle cells and ultimately are converted into dense retracting connective or cicatricial tissue, while, *pari passu*, the epithelium of the affected portion passes from the columnar to the pavement variety.

The contraction of the cicatricial tissue gradually strangulates the exuberant vascular supply of the granulation tissue, the affected area becoming as anæmic as it was previously plethoric. At the same time it gradually changes in color from florid to pale or pearly white. By this means Nature, by a process of substitution, cures the disease, *for not only does the conversion of granulation tissue into cicatricial tissue obliterate the former, but in addition the gonorrhœal virus, or exciting cause of granulations, disappears, and its further propagation is rendered impossible.*

It should be borne in remembrance that the conversion of granulation into cicatricial tissue is a slow process, requiring months, or even years, for its completion, and may be more advanced at one part than another. Side

by side may frequently be seen all gradations, from the florid, papillary surface of recent granulation tissue to the pale, dense cicatricial tissue of the completed process.

While we cannot but admire Nature's method of working out a cure in these troublesome cases, we must admit that it is an evidence that she sometimes bungles in her handiwork, for she relieves one malady by the substitution of another, often of more serious import, namely, the replacement of granulation tissue by cicatricial tissue.

It often happens that this is a matter of no importance, as when limited areas of the mucous membrane alone are involved, resulting in superficial callosities which do not produce an appreciable diminution of the urethral calibre. When the cellular infiltration involves not only the mucous membrane, but also the submucous and cavernous tissue, the resulting transformation into retracting connective tissue may produce serious changes in the lumen of the urethra, varying from slight coarctations to almost total occlusion.

From what has been said about the analogy of the disease as it appears in the urethra and conjunctiva, we would naturally infer that they would pursue a similar course, namely, the cure of the disease by the conversion of granulation into cicatricial tissue. This is just what happens in the conjunctiva, where the resulting cicatricial contraction frequently produces, as in the urethra, marked deformity of the affected parts.

Now that we have considered stricture and its causes, a similar, though much briefer, exposition of gleet and its causes will be necessary before we can establish, in a satisfactory manner, the relationship of the two diseases.

Gleet has been defined by Hunter, Cooper, and other

authorities, as an imperfectly cured gonorrhœa. This definition deals with the cause of the disease, and is open to the criticism that it is scarcely broad enough in its scope, since there are undoubtedly cases of gleet that are not gonorrhœal in origin.

Gleet is a chronic muco-purulent discharge which escapes from the meatus as the morning-drop, and is less noticeable, or may be absent, during the day, when the urethra is frequently flushed during urination. The discharge in certain low grades of urethral inflammation may be muco-purulent and scant from the beginning. The terminal stage of a gonorrhœa is also muco-purulent, but we do not apply the term gleet to such cases unless they become chronic.

The constituents of the gleety discharge are mucus, pus, and epithelial cells, the proportion of each varying with the varying conditions of the urethra. An exudation of mucus free enough to escape from the meatus is not always pathological, as it may be witnessed in an otherwise healthy urethra under intense sexual excitement. This is, however, but transitory and has no relationship to gleet.

The proportion of pus cells depends somewhat upon the intensity of the inflammatory disturbance. In a general way we may say, the more marked the inflammation the greater the proportion of pus cells, while the preponderance of epithelial over pus cells is an indication of the favorable progress of the disease. The frequent microscopical examination of the discharge is therefore of some value from a prognostic point of view.

A gleety discharge is an indication of a low grade of urethral inflammation, although the absence of a visible discharge is not necessarily a proof of the absence of a

localized or latent urethritis, as the secretion may be too scant to appear at the meatus, although it is visible as urethral or pus threads in the recently voided urine. The inflammatory origin of gleet is universally conceded; the only debatable question that may arise concerns its source, whether from a catarrhal or a granular urethritis, or from ulceration of the mucous membrane. Repeated endoscopic examinations have shown the frequency and often the association of the two former processes, while the same method of examination has shorn ulceration of its terrors and relegated it to a very minor position in the category of urethral ills. We may, therefore, safely say that a gleety discharge has for its source certain areas of the urethra which are in a state of chronic catarrhal or granular inflammation, and that both of these processes are frequently present at the same time, while gleet due to ulceration (by this term is meant ulcers of the urethra so large as to be easily perceptible on ocular inspection) is so rare that for all practical purposes it may be ignored.

It is unnecessary to go into further detail on the subject of gleet. Its relation to stricture, to which much of the foregoing has evidently led up, will next receive consideration. The relationship of stricture and gleet, according to Otis, is simply one of cause and effect. In the light of the pathology of stricture, as shown in this article, the arguments on which this statement is based will not bear investigation. If gleet is a symptom or result of stricture it necessitates the priority of existence of the latter; but it has been shown that stricture tissue is, in the great majority of cases, the terminal stage of a granular urethritis, and it has also been shown that gleet is one of the earliest symptoms of a granular urethritis;

therefore the impossibility of establishing the priority of stricture is evident. A gleety discharge is often observed in simple catarrhal inflammations of the urethra when there is neither a granular urethritis nor a stricture present.

A stricture resulting from a gonorrhœa does not manifest itself until the lapse of months, and often years, after the inception of the gonorrhœa. Guyon collected 142 cases of stricture with the view of ascertaining the length of time that elapsed between the appearance of stricture and the first attack of urethritis. He found that in

4	cases	it	occurred	within one year.
10	"	"	"	" two years.
36	"	"	"	between the second and fourth years.
19	"	"	"	" the fourth and sixth years.
24	"	"	"	" the sixth and eighth years.
49	"	"	"	from ten to fifteen years later.

It is a matter of common observation that the gleety stage of a gonorrhœa is usually well established in a much shorter period, all of which is contrary to what we should expect were the latter a symptom of the former. Were stricture the cause of gleet, we should naturally expect that in those cases that remain untreated the progressively increasing obstruction to the stream of urine produced by the continuous contraction of the stricture would in like ratio tend to aggravate the gleety discharge. On the contrary, it is a very general rule that the gleety discharge progressively diminishes and usually ultimately disappears, notwithstanding that the stricture may be more evident than ever. Even the most ardent disciples of Otis must concede what from their stand-point must seem inexplicable, namely, that a gleet is more commonly associated with those soft, recent coarctations of

slight degree called strictures of large calibre, than with the long-standing dense strictures of smaller calibre. This can be readily explained when we consider that the conversion of granulation tissue into cicatricial tissue obliterates the former, so that when cicatrization is complete the granulations with their gleety manifestation have disappeared.

Another argument that may be adduced to support the above is the fact that traumatic strictures are not necessarily associated with gleet at any stage of their formation, because this variety of stricture has not, as an etiological factor, a preceding granular urethritis.

The genito-urinary surgeons who maintain the dependence of gleet upon stricture have unfortunately made the mistake of placing the cart before the horse; or, to put it more accurately, they have placed two results of the same disease in the false relationship to each other of cause and effect. What is gleet but the muco-purulent discharge resulting from a chronically inflamed urethra? What is stricture but the connective-tissue transformation of the cellular elements of a granular urethritis into cicatricial tissue?

The following deductions on the causation of stricture, and its relations to gleet may be drawn from the foregoing:

1. Strictures are more frequently caused by gonorrhœa than by all other causes combined.

2. Strictures due to gonorrhœa are, in the majority of cases, secondary to the formation of granulation tissue. The latter is caused by the long-continued growth and localization in certain patches of the urethra of the gonorrhœal virus.

3. Granulation tissue in its early stage is one of the

most common sources of gleet. Its ultimate conversion into cicatricial or stricture tissue destroys its gleety manifestation, so that by the time the process of cicatrization is complete the gleety discharge has disappeared.

4. Gleet is an early manifestation, while stricture is a later manifestation, of granulation tissue, but owing to the process of cicatrization being only partially complete they are usually associated with each other. Complete cicatrization obliterates the former and perpetuates the latter.

5. The relationship of stricture and gleet is therefore not one of cause and effect. They are only related in so far as they may be derived from the same source. The evidence produced that stricture may cause or perpetuate a gleet is not supported by recent pathological investigation.

6. The depth to which the granulation tissue has invaded the urethra determines the degree of the stricture. If it is confined to the mucous membrane, superficial callosities are formed which do not obstruct the urethral canal. If the cavernous tissue is invaded, true stricture is produced.

CHAPTER VII.

CHRONIC ANTERIOR URETHRITIS.

Symptoms.

Chronic anterior urethritis is manifested by a slight gleety discharge, which may be noticed as the morning-drop, or may be observed during the day by squeezing the urethra. In many cases the only thing perceptible is a gluing of the meatus, due to the inspissation of the exuded mucus. Not infrequently the discharge may be so slight as to escape the patient's observation, so that he may fancy that he is free from urethral disease, although an examination of the urine at this time will show the presence of characteristic urethral threads, which are never found when the urethra is in a perfectly healthy condition.

If the urine is passed into two vessels, the first part will in its passage along the urethra cleanse the latter of the mucus, pus, and epithelial *débris* that line its surface. The second vessel will contain the urine that has passed over a cleansed urethra, and will be free from these elements unless there should be an associated inflammation of the deep urethra, bladder, or of the ureters or pelvis of the kidney. During an exacerbation of the urethritis the first urine will contain mucus, pus, and epithelial *débris*, in considerable abundance; but during the period of quiescence, when the discharge is slight, only the

gonorrhœal threads may be present. These are noticed as little, threadlike bodies, varying in size and consistency, and are distinguished from mucus or semen, for which they may be mistaken by their firmer consistency and greater specific gravity, rapidly sinking to the bottom of the vessel while the latter float for a time near the surface. A microscopical examination (Fig. 15) shows these threads to consist of mucus, pus, and epithelial cells, rolled into threadlike bodies in a similar manner to the epithelial rolls formed by rubbing the cutaneous surface after a bath. The gonorrhœal threads are formed by the urine in its passage over the urethra, rolling the secretion adhering to its surface into these threadlike bodies and expelling them in the first part of the urine. During the treatment of chronic urethritis the progress of the case may be judged by observing these threads; a diminution in their number and size indicating a corresponding diminution in the inflammatory process. It should be remembered, however, that the number of these threads will depend somewhat on the length of time that has elapsed since the previous urination, as the longer the interval the greater the amount of secretion that will accumulate in the urethra, and hence the

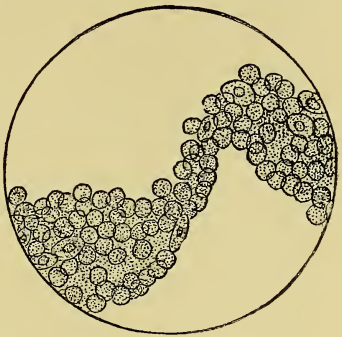


FIG. 15.—A so-called Gonorrhœal Thread, consisting of Pus Corpuscles and Urethral Epithelium. (Ultzmann.)

more numerous the pus threads. Frequent microscopical examinations of these threads, by determining the proportion of pus and epithelial cells, will indicate the progress of the case. A preponderance of epithelial cells indicates that the disease is progressing toward recovery.

A characteristic symptom of chronic urethritis is the exacerbations that frequently ensue on the slightest provocation. A patient, under the impression that he is perfectly free from the disease because of the disappearance of the discharge, takes advantage of the license his apparent cure may give him, when lo, on the following morning there is a profuse purulent discharge. He is prone under these circumstances to fancy that he has contracted a new gonorrhœa, and believes that he is peculiarly susceptible to the disease, since every venereal contact is followed by a purulent discharge. The exacerbation subsides in a few days, whether treated or untreated. If the former, the patient usually attributes his rapid recovery to the use of some favorite injection, and carries the prescription around with him as a specific for the cure of gonorrhœa, citing his own case as proof of its efficacy. These are also the cases in which some physicians bombastically laud their ability to cure a gonorrhœa in from two to five days.

What has taken place may be explained by the fact that the patient has a damaged urethra, certain areas being in a condition of latent granular or catarrhal inflammation. Any indiscretion, such as sexual congress or intemperance, sets up an active inflammation in the damaged areas, the discharge from which, passing over the otherwise healthy portions of the urethra, sets up an acute but transitory inflammation of the latter, which is

manifested by the escape of a purulent discharge that may contain gonococci.

The theory that these exacerbations are produced by reinfection by gonococci which have found an abiding-place in some damaged portion of the urethra, and owing to the lowered vitality of the urethral tissues are enabled to temporarily resume the activity which repeated cultures in the same soil had deprived them of, will not apply to all cases, but is probably the best explanation that at the present time can be given, and is supported by the fact that the gonococci, which may have almost disappeared during the period of quiescence, are usually found in abundance in the discharge of the exacerbation. If these exacerbations are due to reinfection of the urethra by the gonococci liberated from the damaged areas, their vitality and ability to penetrate the mucosa must be much weakened, for the resulting inflammatory disturbance subsides in a few days and the urethra is rapidly restored to its previous condition. We may infer that the lightness of these recurring attacks is not wholly due to the additional resisting properties that the urethral tissues may have acquired from repeated infection, from the fact that the same urethra, if infected by gonococci from external sources, will pass through a nearly typical course of gonorrhœa.

A symptom frequently met with in chronic urethritis, as well as in the terminal stage of an acute gonorrhœa, is a peculiar, uneasy, ill-definable sensation, due to a hypersensitive condition of the urethra, which is instantly, but temporarily, relieved by the benumbing effect of the passage of a sound. Lancinating pains, which for want of a better name may be called neuralgia, sometimes shoot along the urethra, terminating in the glans penis;

this, however, is more frequently met with in diseases of the posterior urethra.

Frequency of urination is not a symptom of chronic anterior urethritis, but there may be a slight tingling pain in the act. In the exacerbations of the inflammation, urination, if the urine be acid, may be quite painful.

The patient who has a chronic urethritis will often complain that after he has urinated, and apparently completed the act, a few drops of urine will escape from the urethra and soil his clothes. This is due to the fact that the urethra, as a result of chronic infiltration, is sclerosed, and does not immediately collapse on the termination of the act, but remains for a few moments as a more or less rigid tube, until the elasticity of the urethra overcomes its rigidity, when the urethra collapses and the contained urine dribbles from the meatus.

CHAPTER VIII.

URETHRAL ENDOSCOPY.*

The localization of chronic urethritis to distinct areas, where, as a result, gross pathological changes are manifested, requires for its proper treatment not only that we should be able to apply the remedial agents to the affected areas, but also that we should, first of all, be able to inspect the urethra, in order to determine the nature and situation of the morbid processes which we desire to treat. For this purpose we resort to the use of the endoscope, by which we are able to inspect the urethra under artificial illumination.

Desormeaux, who is deservedly called the father of endoscopy, was not the first to use the endoscope, but was the first to bring it into practical use. His instrument, introduced in 1853, was, however, clumsy, and only permitted of inspection of the urethra. Since then the endoscope has been variously improved and simplified, until it is now a very satisfactory instrument. Some of the endoscopes at present in use permit only of the inspection of the urethra; but only those that permit of local applications to the urethra during inspection need be considered, as all others fail in the most useful part of the instrument. Only a few of the numerous endoscopes

* This chapter on Urethral Endoscopy, and the following chapter on Urethral Mensuration, are inserted here because a knowledge of these subjects is essential to the proper understanding of the treatment of chronic urethritis.

will be described, and of these the reader may be safely left to make his own selection.

Gruenfeld reduced the instrument to its simplest proportions. His instrument (Fig. 16) consists of a simple tube, with its vesical extremity blocked with an obturator

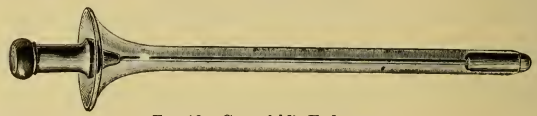


Fig. 16.—Gruenfeld's Endoscope.

to facilitate its introduction into the urethra. The ocular extremity is funnel-shaped to facilitate the passage of the rays, and the interior of the tube is darkened to prevent the reflection from its surface interfering with the field of vision. Klotz found that a perfectly polished interior did not interfere, but rather made the field of vision clearer, and further improved Gruenfeld's instrument by substituting a flange for the funnel-shaped extremity, which prevents painful distention of the meatus, and by enabling



Fig. 17.—Klotz's Endoscope.

the operator to crowd the instrument into the urethra a shorter tube can be used and the field of vision therefore brought nearer to the eye.

With the instrument of Gruenfeld or Klotz the light is reflected by a head-mirror into the endoscopic tube after the manner in which the laryngologist examines the larynx, the light may be either a McKenzie lamp or an incandescent electric light. It requires a little experience

to enable the operator to focus the light properly on the field of vision, but when once it is acquired it is a very satisfactory method of using the endoscope.

The next form of instrument carries a small electric lamp fixed to the instrument, so that the field of vision is under constant illumination. The best-known type of this instrument is the Leiter instrument (Fig. 18), or the modification that has been made by Otis (Fig. 19). Hawkins has devised an endoscope on similar lines that certainly gives good illumination. These instruments are, however, unnecessarily clumsy, and they require a battery or current reducer, the lamps burn out, the batteries get out of order, and the wires are often a nuisance, so that I would recommend the beginner to accustom himself to the simple tube and head-light of the Gruenfeld or Klotz instrument.

A still more complicated endoscope is the one devised by Oberlander and improved by Kollman, in which the source of light is at the distal extremity of the instrument, close to the field of vision. While this instrument gives excellent light the space taken up by the wires and the necessary cooling apparatus seriously interferes with its usefulness; besides, it is a very cumbersome apparatus, and is, on the whole, only superior to the other simpler instruments in impressing the patients, and is decidedly inferior to them in point of usefulness.

Van Antel invented an instrument for examining the urethra while the latter is distended with air, but as only a portion of the urethra can be examined by this instrument, and as the portion that can be examined is rendered anæmic, by the distention, the value of the instrument is but very slight. Fenwick has devised a urethroscope on the same principle as Van Antel's in-

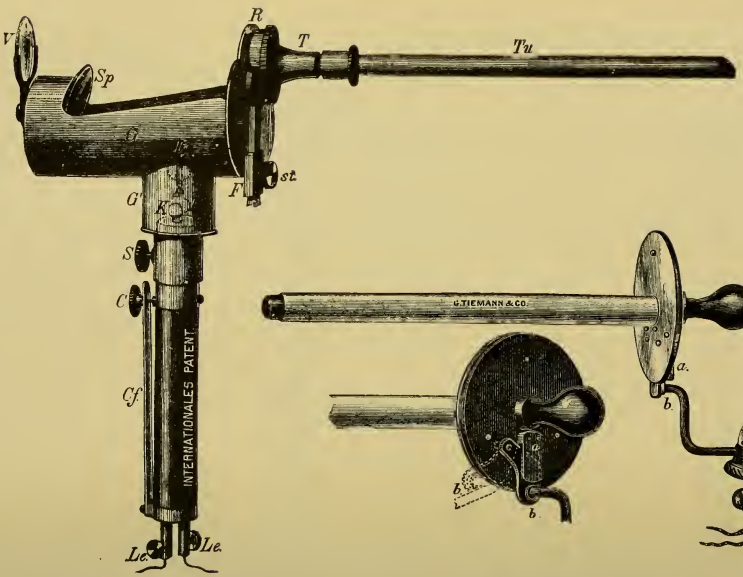


FIG. 18.—Leiter's Endoscope.

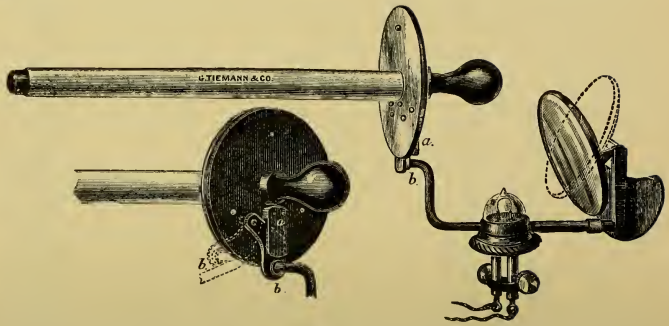


FIG. 19.—The Otis Endoscope.

strument, but uses the electric light for the purpose of illumination. Various long urethral speculums have been devised for examining the urethra, but they are chiefly useful in the removal of papillomatous growths or to facilitate the cutting of strictures near to the meatus.

For the endoscopic examination of the urethra tubes ranging in size from 20 to 26 F. should be used. Smaller ones are unsatisfactory and larger ones are unnecessarily painful. Any table of a convenient height will do for the purpose. The instruments and applications should be convenient to the operator, so that it will not be necessary for him to drop the instrument until the examination is complete. It is advisable to conduct the examination in a darkened room, as a bright light diminishes the clearness of the field of vision.

The endoscopic examination is conducted from behind forward, the tube being inserted as far as the membranous urethra, or, if desired, as far as the vesical orifice of the urethra. The insertion of a straight tube into a curved urethra frequently puzzles the beginner, but the necessary tact is easily acquired. The method of performing this little feat is as follows: The patient being in the recumbent position, the operator, standing to the left of the patient, introduces the endoscopic tube down to the bulbous urethra, care being taken to keep the distal extremity of the tube against the roof of the urethra at this point, while the ocular extremity is depressed toward the feet of the patient. Simultaneously with this movement the right hand, resting against the root of the penis, forcibly depresses the latter, which relaxes the suspensory ligament and tends to straighten the urethral canal; with this movement the endoscopic

tube should be steadily pressed onward, when it will be felt to slip through the isthmus and into the posterior urethra, where its further progress offers no difficulties. The difficulties the beginner usually meets with are from pressing the tube too far down into the bulbous urethra, where it is liable to pass beyond the isthmus, and from too forcible depression of the ocular extremity before it is passed into the posterior urethra.

In this, as in all other urethral instrumentation, the utmost gentleness must be used, otherwise the results will be extremely unsatisfactory, as the reaction following an endoscopic examination may be so severe as to preclude its further use.

It is rarely advisable to pass the instrument through the vesical orifice of the urethra as the annoyance of the escaping urine will be considerable. It should, however, be passed deep enough to freely expose the caput gallinaginis. In some cases, where from the symptoms and the results of the examination of the urine we can positively exclude a pathological condition of the posterior urethra, it is not necessary to pass the tube beyond the isthmus of the urethra.

The endoscopic appearance of the urethra in health and in disease is somewhat difficult to describe. Such information is best conveyed by means of clinical demonstrations. There are, however, several fundamental principles governing the subject of urethral endoscopy which the beginner should bear in mind.

If we expose the healthy urethra in the cadaver, by a longitudinal incision, we find that it is an exceedingly delicate, pale, glistening membrane, resembling the conjunctiva. Its surface is smooth and reflects the light throughout its whole extent. If we make traction on its

cut edges, its lateral extensibility is seen to be considerable, but varies in different portions of the urethra.

During life the same appearances are present, modified, however, by the blood-vessels, which give to it a pink color, which varies in depth in different portions of the urethra, and is darker in the dark-skinned than in the fair. The same smoothness and glistening qualities pertain to it in life as in death. Disease produces variations in the appearance of the urethra that are easily recognizable by endoscopic examination. These variations are dependent somewhat on the nature and duration of the disease. A recent acute inflammation of the urethra produces a marked hyperæmia and consequent increased redness of the mucous membrane, and the smooth, glistening appearance will be dimmed or clouded by the desquamation of the epithelium, and the bathing of its surface with pus, mucus, and epithelial *débris*.

Patches of chronic inflammation present a variable appearance, dependent on the nature and duration of the inflammatory process. If in the posterior urethra, the mucous membrane presents a papillated, velvety appearance, and its glittering smoothness is lost. Patches of granulation tissue present the characteristic mulberry appearance, and occasionally trachoma may be observed. If the granulations are recent, they bleed with the slightest touch; if of long standing, cicatrization may have begun. In the latter case the granulation tissue may be streaked with paler areas which mark the sites of beginning cicatrization or stricture formation. Adjoining areas may be healthy, but are more often in a state of catarrhal inflammation, indicated by a cloudiness of the surface. Side by side may be seen patches of granulation tissue; part in a florid vascular condition, part

less vascular undergoing cicatrization, with other patches of smooth, pale, gray tissue, that mark the completion of the process of cicatrization. In juxtaposition with the above there may be seen areas that are healthy or undergoing a mild catarrhal inflammation.

In chronic urethritis the orifice of the urethral glands may sometimes be seen as minute slightly elevated points, and the orifices of the lucunæ are often marked by minute epithelial erosions. *The infection of these glands and lacunæ is a prolific cause of the prolongation of a gonorrhœa, and it has been observed that it is in the situation where they are most numerous that chronic lesions are found with the greatest frequency.* I have noticed in a number of cases, when the endoscopic tube was withdrawn to that portion of the bulbous urethra which marks the site of the opening of the ducts of Cowper's glands, a drop of pus, and sometimes a little gush of thin, milky-looking fluid, would suddenly appear in the field. The inference to be drawn from this is, that not infrequently Cowper's glands are involved in the chronic inflammatory process and may be the source of many obstinate urethral discharges.

In the withdrawal of the endoscope the retreating tube is closely followed by the collapsing urethral walls, which form the side of a cone or funnel; the apex of the cone is called the central point of the endoscopic field and is the point of apposition of the urethral wall. As the urethra collapses around the extremity of the endoscopic tube, to become approximated at the central point, it is thrown into minute ridges, which are most marked at the centre and disappear toward the periphery (Fig. 20). If the urethra is healthy and resilient these ridges are most minute, and may be imperceptible, although they can

usually be detected. If the urethra, however, has lost its resiliency from any cause, such as œdema of its walls, chronic infiltration, or stricture formation, it will collapse less uniformly as the tube is withdrawn from the urethra, and will be thrown into larger folds, as in Fig. 21, which



Fig. 20.



Fig. 21.



Fig. 22.

represents the swollen urethra in an acutely inflamed condition, or in Fig. 22, where the urethra is rigid from stricture formation. The shape of this funnel is of considerable importance, as it indicates the degree of resiliency of the urethra. If the urethra is rigid from chronic infiltration with sclerosis, it will collapse less readily, and the funnel formed on withdrawal of the tube will be longer than normal. If the infiltration is recent and soft, as in acute inflammation, the opposite condition is found

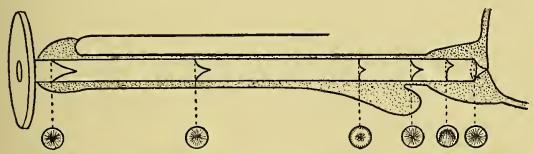


Fig. 23.—Diagram illustrating the shape of the Endoscopic Funnel.

—the funnel will be very short and the urethral walls may even bulge into the endoscopic tube.

In the healthy urethra the appearance of the funnel varies in different portions of the urethra (Fig. 23). It will be well for the beginner to familiarize himself with these normal variations, otherwise endoscopy will be very puzzling. At the vesical orifice the funnel is short, and

the apex occupies the centre of the field. As the tube is withdrawn the caput gallinaginis gradually comes into view, at first as a slight protuberance on the floor of the field, gradually increasing in size as the instrument is withdrawn, until, when fully exposed, it occupies two-thirds of the endoscopic field, the apex of the funnel, being convex, conforming to the contour of the caput gallinaginis. On further withdrawal of the tube the caput rapidly disappears and the apex resumes its central punctate form. This point marks the entrance into the membranous urethra, where the funnel is short and the puncta in the centre of the field. The bulbous urethra is next entered. Here is the field of the greatest muscular activity. The accelerator urinæ squeezes the urethral walls forcibly against the end of the tube, and may even expel the endoscope if it is not firmly held. This may be obviated by tilting upward the ocular extremity of the instrument. At this point the muscular activity of the urethra forces the mucous membrane into the tube so that the funnel practically disappears. The withdrawal of the instrument into the pendulous urethra is marked by the cessation of muscular activity, and the prolongation of the funnel. At the fossa navicularis the funnel is longest and the canal not wholly obliterated at the apex, where the central figure may be very large and irregular in form.

If, during endoscopic examination, the tube is rapidly withdrawn from the urethra, the funnel will be longer than if the instrument is withdrawn slowly. It is well, therefore, to accustom one's self to withdraw the instrument at a uniform speed.

To recapitulate: Urethral endoscopy can only be properly taught in the clinic room, and the beginner

should first familiarize himself with the endoscopic appearance of the healthy urethra, and then study the changes produced in the urethra by disease. The important points to note are the color, degree of smoothness, and lustre of the urethra; the character and amount of secretion on its surface; its resiliency as indicated by the shape of the cone and central figure, and the more or less alteration of the ridges of its surface.

CHAPTER IX.

URETHRAL MENSURATION.

For the purpose of measuring the interior of the urethra, with special reference to abnormal points of contraction, we may have recourse to a number of instruments. A few of these will, however, suffice. Among the number we may mention the steel sound, the bulbous bougie, and the urethrometer.

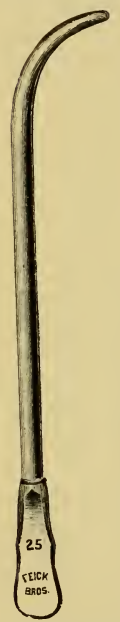


Fig. 24. — The Conical Steel Sound.

The steel sound (Fig. 24) is of value in determining the calibre of the urethra at its narrowest point. If it is passed into the urethra and is neither resisted on its entrance nor held on its withdrawal—slips in and out unobstructed—we may safely say that the calibre of the urethra at its narrowest point is at least equal to the size of the sound. For many purposes this is all that is required; and on the results of this examination we may frequently assure our patient that we can exclude stricture of the urethra from being one of the pathological conditions from which he is suffering. If the sound, after passing freely for a certain distance, butts up against an obstruction which it will not readily penetrate, or if it penetrates the obstruction and is

held by the latter on its withdrawal, we may justly conclude that a stricture exists at the point of obstruction.

While the sound is the least irritating of all the urethral instruments that are used for measuring the urethra, its application is limited. It is of more negative than positive value. By this is meant that while with the sound we may in many cases exclude a stricture; yet where a stricture is present it is often difficult of determination and exact localization by the sound; and the latter is valueless in measuring the urethra posterior to the point of stricture.

The bulbous bougies, which should be flexible (Fig. 25), are of more value in determining the exact location of



Fig. 25.—The Bulbous Bougie.

a stricture, but are open to the objection of the sounds that they are unsuited for the measurement of the urethra where an anterior stricture is present, and they are also very liable to be held, on withdrawal, by normal urethral folds, and give a sensation as if a stricture was present where none really exists.

It frequently happens that the meatus may be so narrow as to preclude the use of either bougies or sounds of sufficient calibre to measure the urethra. To overcome these objections the urethrometer has been devised. It is introduced closed, and can be opened or dilated within the urethra to any desired extent. The urethrometer in common use is the one devised by Otis (Fig. 26). The cut of this instrument explains its mechanism so well that it is unnecessary to waste words on either its description or use.



FIG. 26. — The Otis Urethrometer.

As the accuracy of the results obtained by this urethrometer depends on the skill of the operator and the sensibility of the patient—two very variable factors—the results obtained are often unreliable. In order to eliminate these two uncertain factors I have devised an urethrometer (Fig. 27) on a different principle. This instrument is introduced within the urethra to the desired distance, when a spring is released which expands the measuring arms. The latter maintain a uniform pressure against the urethra, regardless of whether they are passing through a dilated or a contracted portion. The operator has, therefore, simply to introduce the instrument, release the spring, and follow the reading of the index as it is withdrawn. This instrument has proven perfectly satisfactory from a mechanical point of view, but it is open to the objection, in common with the other urethrometers, that it is more irritating and painful than the sound.



FIG. 27. — The Author's Urethrometer.

The physician who understands the nature, and is not disposed to magnify the evils, of stricture of large calibre, will rarely find it necessary to bring into requisi-

tion either the bulbous bougies or the urethrometer, and as his experience increases the greater will become his reliance on the steel sound, and the less will he depend on the use of more complicated instruments in the estimation of the calibre of the urethra and in the diagnosis of urethral stricture.

CHAPTER X.

CHRONIC ANTERIOR URETHRITIS.

Treatment.

Of all the diseases that the genito-urinary surgeon is called upon to treat, there is none that he meets more frequently, none that is so obstinate in yielding to the ordinary remedies, and none that is more harassing to the physician and patient than chronic urethritis.

Before falling into the hands of the specialist the patient has probably made the usual rounds, from one physician to another, and has been buffeted from pillar to post until he despairs of a cure. In the meantime the disease has, in his imagination, assumed a magnitude proportionate to its persistency. Before the pathology of the disease was properly understood, and before endoscopic examination and treatment were employed, the annoyance caused by this disease fully justified Ricord's celebrated definition of hell as a place where patients were continually clamoring to be cured of their gleet.

At the present time, however, under modern methods of treatment, chronic urethritis has become much more tractable, and the results are often highly satisfactory.

If a patient applies for treatment during one of the exacerbations of his chronic urethritis, we should not forget that for the time being we have an acute inflammation to deal with, requiring the hygienic precautions and

the remedies that are efficacious in the treatment of acute urethritis. In these cases the temptation is great to yield to the importunities of the patient, to adopt heroic methods of treatment, either by powerful injections or by the use of instruments. It is a cardinal rule, however, never to introduce an instrument within the urethra when it is actually inflamed. To this rule there is only one exception, and that is when it is necessary to introduce an instrument for the relief of a greater evil, such as retention of urine.

Granted that the exacerbation has subsided, and that the patient complains of but little but the gleety discharge, the question comes up, what line of treatment should we pursue? The patient will probably volunteer the information that he has tried the various internal remedies and injections in common use, with the uniform result, that while the exacerbations yield to treatment the inflammatory disturbance is only ameliorated and not cured, as proof of which he refers you to the gleety discharge, of which he is unable to rid himself.

Unquestionably the only rational treatment to pursue in such cases is the local treatment of the inflamed areas, undertaken with the view of restoring the urethra to a healthy condition. It is not to be understood by this that treatment of a general character is to be ignored. On the contrary, it is important that such measures shall be pursued as will tend to soothe the inflamed urethra; excessive acidity of the urine should be counteracted, stimulating drinks and sexual excesses should be rigorously tabooed.

Having decided on local treatment the first thing to be done is to pass a steel sound along the urethra. A volume might be written on this subject alone; in fact,

it is a difficult task to do it justice within a limited space. I have stated that a steel sound should be passed, while fully conscious that no less an authority than Sir Henry Thompson, in his recent work on "Diseases of the Urinary Organs," gives the preference to flexible instruments. He says: "No patient will willingly allow another surgeon to pass for him a solid instrument, if you have passed for him a flexible one as easily as you may readily do. The latter gives so much less pain than any other, and produces so much less irritation." With all due respect for the authority quoted, I contend that the solid instrument, properly manipulated, is the least irritating to the urethra, and the easiest for the patient to bear. It is true that where the urethral canal is tortuous, as is frequently encountered where there is an enlarged prostate, a flexible instrument will pass with the greatest ease and the least damage to the urethra, but this condition is foreign to the subject under discussion.

Instruments under No. 18 of the French scale should be flexible, as solid instruments under that size are liable to damage the urethra, even if carefully handled. If the operator is a novice in the art, or if stupidity and ignorance combined, prevent him from recognizing the necessity of delicate manipulation, then by all means should he use a flexible instrument, and thus reduce to a minimum his capability of damaging the urethra. It is not saying too much to assert that the fate of the genito-urinary surgeon depends on the deftness with which he passes a steel sound. If he is awkward and rough in the passage of this instrument he will never be successful, no matter how much learning he may bring to bear on the subject. A patient never forgives rough treat-

ment with his urethra, once it has been shown him with what ease the sound will pass if properly used.

In passing a sound on a patient for the first time select one that is large enough to comfortably fill his urethra. Do not make the mistake of selecting one too small, for this will only increase the difficulties. Warm the sound to the temperature of the body, and oil it well. Assure the patient that you will deal gently with him. It is useless to try to direct his attention from what you are doing, for he looks on the operation as too serious to permit his attention to be distracted from it by any artifice. The patient being in the recumbent position, the operator standing at his left side, inserts the tip of the instrument within the urethra, its axis corresponding with that of the latter; the butt end of the instrument should be lightly grasped by the thumb and forefinger of the right hand, while the same fingers of the left hand should grasp the glans penis, keeping traction on it, which prevents the sound from catching on the folds of the urethral mucous membrane (Fig. 28). As the sound advances the butt end is gradually tilted upward so as to keep the axis of the instrument and the urethral canal in line. When the tip of the instrument has reached the subpubic curvature, the right hand ceases to guide or support the instrument, which is now permitted to pursue its own course within the urethra, its propelling force being its own gravity, its guiding agent being the urethra itself. At this stage the passage of the sound may be materially assisted by pressing with the free right hand on the pubic junction of the penis, which relaxes the suspensory ligament and tends to straighten the urethral canal. At the same time the free fingers of the left hand should press against the urethra at the subpubic

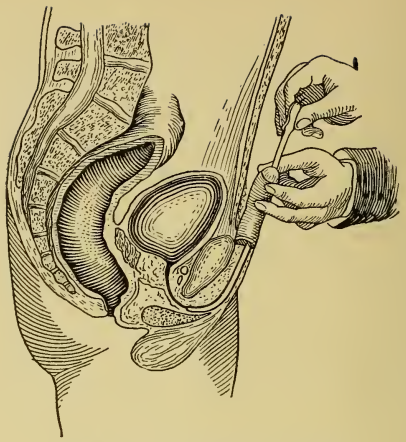


FIG. 28.—Passage of Sound (First Stage).

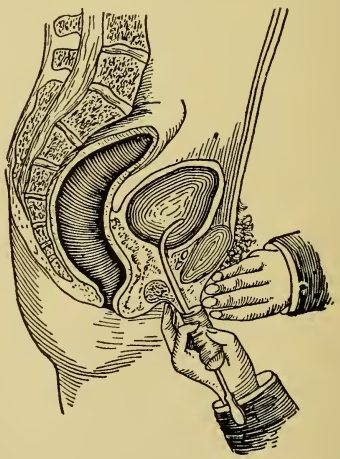


FIG. 29.—Passage of Sound (Second Stage).

curvature, while the penis is swept away from the body and toward the feet of the patient; the extent of this motion being guided by the sensations imparted by the instrument (Fig. 29). If this manœuvre is properly executed the sound will pass without a hitch, and almost painlessly, into the bladder.

There is nothing more exasperating than to witness an unskilful operator introduce a sound. He grasps the instrument and handles it as if he had to make a canal, rather than to follow one. He has well-defined anatomical ideas as to the course the urethra should pursue, and to his ideas the urethra must conform, regardless of its detriment in doing so.

If it were only realized with what exquisite sensibility the urethra is endowed, and of what delicate structures it is composed, surely there would be more forbearance shown, and more gentleness and patience exercised in its instrumental treatment. Unfortunately the combination of ignorance and unskilfulness oft go hand in hand, and nowhere is more potent for evil than in the urethra.

A great stumbling block to the unskilful manipulator of urethral instruments is the membranous portion of the urethra where it passes through the triangular ligament and is grasped by the compressor urethræ (Fig. 3), and here we meet that which is often but a cloak to cover the awkwardness of the operator, and is the bugaboo of the novice, namely, spasmodic stricture. While a spasm of the external sphincter muscle (compressor urethræ and external prostatic sphincter) is not infrequently met with, especially in nervous subjects who are undergoing their first examination, no amount of spasm will prevent the passage of a steel sound if it is properly manipulated. *Where there is a failure to pass a sound through*

the urethra, it can only indicate either unskilful manipulation, organic stricture, or a tortuous urethra from prostatic enlargement.

The objects to be attained by the passage of the sound are both diagnostic and therapeutic. As the sound is passed, its contact with the diseased and tender areas will give rise to painful sensations, by which means the operator becomes cognizant of their situation. It should be remembered, however, that certain situations in the urethra are more sensitive than others; as the sound passes over the caput gallinaginis a sickening sensation is often experienced, and in long-standing inflammatory affections of this part, especially if associated with deep structural changes, this sensation may be heightened to a degree that is distressing. The healthy pendulous urethra is more sensitive than the bulbous urethra, but this seems to be owing to the fact that it yields less readily to the passage of the sound. I have noticed, however, in many urethræ which have suffered from a gonorrhœa, that at a point about an inch and a half from the meatus the urethra is very sensitive, although no lesion could be discovered in this situation to account for it.

The gentle passage of the sound never causes hemorrhage in the healthy urethra, and when such does occur it indicates either unskilful use of the sounds or a pathological condition of the urethra.

The therapeutic or remedial effects of the passage of the sound may be classified as follows:

1. The allaying of urethral hyperæsthesia.

2. The restoration of the urethral canal to its normal calibre, and the absorption of inflammatory products.

3. By expressing the contents of the suppurating ure-

thral glands and lacunæ, it exerts a curative influence on the pyogenic process.

When a sound which comfortably fills the urethra has been passed, a second sound, even larger than the first, may be passed without eliciting as much pain. The first sound, by its pressure on the terminal filaments of the nerves, has an obtunding or anæsthetic effect on the urethra; for this reason it is advisable that a sound be passed previous to the introduction of other urethral instruments. In the dilatation of strictures much suffering may be avoided if the sensibility of the urethra is obtunded by the preliminary passage of a sound which only exerts a gentle pressure on the urethra. A patient who has had an acute urethritis will often, after the discharge has ceased, complain of teasing pains in the urethra, and an indefinable feeling that it is not altogether in a healthy condition. If the sound is gently passed in his urethra, he will at once express the feeling of relief and comfort he has obtained. In the course of two or three days this hyperæsthetic condition returns, but with diminished intensity, and will entirely disappear on the repetition, for a few times, of the passage of the sound.

To understand the second therapeutic object for which the sound is used a brief *résumé* of the condition in which the urethra is usually found in chronic urethritis will be necessary. The mucous membrane at the inflamed areas is thickened from increased proliferation of the epithelial cells, and infiltration of the mucous and submucous tissues, with leucocytes, which, where granular urethritis exists, show a marked tendency to connective-tissue formation and cicatricial contraction.

Mr. Berkeley Hill, in his work on chronic urethritis, says: "If the induration has invaded a long tract of the

canal, over such tracts the mucous membrane is irregular in contraction and grayish in hue, or there may be alternating red patches of chronic inflammation and gray patches of contraction. These varieties follow each other in quick succession, so that in the same urethra there may be, perhaps, a dozen different patches, some old, gray, and shrunken; some dull red, but unyielding; some covered by granulations; in some where the infiltration has not taken place, or has been absorbed, the tissue is again yielding and resilient." Such a urethra as is pictured above has lost much of its resiliency, and in certain portions well-defined contractions may be detected with the urethrometer. In these cases, if the sounds are passed every third or fourth day, each successive sound being slightly increased in size, the inflammatory exudates will slowly disappear, the patient will often observe that his urethra is becoming softer, or, as he expresses it, it feels more natural, and the dribbling of urine, so often complained of as taking place a few moments after urinating, will cease to annoy him. This dribbling is caused by the rigid urethra, which does not collapse immediately after urinating, and consequently the emptying of the canal is only accomplished when the muscular and elastic tissue of the urethra is able to overcome its rigidity.

The manner in which the periurethral exudates undergo absorption as a result of the systematic passage of the sound is not easy of explanation, but it is probably due to the slight reactionary inflammation producing degenerative changes which facilitate their absorption; the latter being aided by the process, allied to massage, which the sounds exercise against the urethral walls.

There is no evidence to prove that exudates which

have undergone true connective-tissue formation eve undergo absorption or removal by any method of treatment short of actual destruction of the tissue, though the passage of the sounds may produce a rearrangement of the connective-tissue cells, and thus increase, by stretching and thinning of the stricture, the lumen of the urethra at the constricted point.

In connection with the subject of the passage of sounds there arise the pertinent queries: What is the normal calibre of the urethra, and To what size should the urethra be dilated?

These are difficult questions to answer, since no definite measurement or rule can be given. The law formulated by Otis, that the calibre of the urethra bears a definite relationship to the circumference of the penis, has been, I unhesitatingly state, productive of incalculable mischief; and in conjunction with another law, laid down by the same authority, namely, that stricture is the progenitor of gleet, has done more to injure urethral surgery in this country than anything I can think of. In the public clinics of our colleges it is not uncommon to see a patient with a chronic urethritis subjected to the following line of treatment:

The circumference of his penis is taken, which, by the way, is a very variable quantity, even in the same urethra. From this measurement the calibre of the urethra is estimated, and the statement boldly made that the patient's urethra should permit of the passage of a certain-sized sound, usually much too large. The next step is to compel the unfortunate urethra to swallow the sound, whose dimensions has been obtained from the circumference of the penis, and woe betide the patient if Nature has not provided him with a capacious urethra. His

meatus is slashed with a boldness that would compel admiration were it in a better cause. His urethra is explored for strictures, and in such hands a stricture can always be discovered, the slightest coarctation in the dilated urethra is pounced upon, as if it were a deadly enemy, and subjected to the most ruthless and often unnecessary treatment.

There is no more justification for saying that the size of the urethra bears a definite relationship to the size of the penis than there would be to say that the size of the œsophagus bears a definite relationship to the size of the neck. Unfortunately for the urethra it is a patient canal and will often submit to extreme dilatation, so that sounds of very large size can be forcibly passed; but while this proves the great dilatability of the urethra, it is far from proving that the size of the urethra is equivalent to the largest sound that can be made to pass.

While no definite rule can be laid down concerning the calibre of the urethra, we must necessarily have some idea of its size in a given case. This is, however, a matter which must depend on the judgment of the surgeon. In my own practice, *if I can pass a No. 26 French sound, without its being obstructed in its passage or held on its withdrawal, I have no hesitation in assuring the patient that he has no stricture. Even if in such a urethra I detect points of narrowing with the urethrometer, which may be classified as strictures of large calibre, I make my assurance none the less positive, as I cannot recognize a stricture which readily permits the passage of a No. 26 French sound, as being of itself the cause of any urethral disease, or requiring treatment.* It is true that I may introduce, in the treatment of the urethra, instruments of a larger size, but that is done for the pressure effects on the urethra, the dilatation of existing

strictures of large calibre being a secondary consideration. I rarely, however, introduce a sound of a larger size than No. 32 French, and seldom permit the instrument to remain longer *in situ* than a minute—its retention for a longer period being not only too painful, but it is followed by too much inflammatory reaction.

The passage of the sounds has a beneficial effect on the pyogenic process, which is such an obstinate feature of chronic urethritis.

It has already been shown how a gonorrhœa is often prolonged by its localization in the urethral follicles and glands, in which situation it is but little amenable to the action of injections ; if a sound is passed in such a urethra, its withdrawal is followed by a drop of pus which was previously invisible. In order to differentiate between the pus on the free surface of the urethra and the pus that is lodged in the urethral crypts, it is only necessary to have the patient urinate immediately before passing the sounds. By this means the pus on the free surface of the urethra will be washed out with the urine. If a drop of pus now appears immediately after the passage of the sounds, the inference is obvious that it is the aggregate of the contributions made by the urethral follicles and glands at the time their orifices were dilated and their walls squeezed by the passage of the sound. The emptying of these suppurating crypts cannot but have a beneficial effect, especially if, as is probably often the case, their ducts had previously been occluded. Fig. 30 illustrates this action of the sounds on the urethral crypts. A careful observation of this point will demon-



FIG. 30. — Diagram Illustrating the Action of the Sounds in Expressing the Contents of the Urethral Crypts.

strate the great frequency with which chronic urethral discharges are localized, in whole or in part, to the urethral glands and lacunæ, and it is probably more from the emptying these crypts than from any other cause that the passage of the sounds is so efficacious in the treatment of gleet.

It not infrequently happens that the meatus, which is one of the physiological points of narrowing, prevents the passage of sounds sufficiently large for the dilatation of the urethra to the desired extent. If a contracted meatus offers an impediment to the treatment of the urethra, the inflexible rule is that it should be unhesitatingly cut. Its incision is simple, safe, and satisfactory, while attempts at dilatation or divulsion are as brutal as they are useless, and should receive the strongest condemnation of the profession. The meatus should only be cut to a size which will readily permit the passage of an instrument of the size to which we wish to dilate the urethra. Cutting beyond this size is unnecessary, injurious, and unjustifiable. I protest against the reckless laying open of the glans penis down through the frænum, which one sees so often, as the result of treatment in the hands of some specialists, whose claim to the title seems to rest on their special eagerness to use the knife, and special ignorance of its proper use.

A recent writer on stricture (Lydston) goes so far as to say that he "practised with advantage" stitching of the edges of the quasi-mucous covering of the glands and the mucous lining of the urethra together for the purpose of insuring the patency of the meatus, and follows this up by saying: "In some cases the frænum præputii is attached so far forward that a proper meatotomy cannot be performed. In such cases the frænum should be

cut away in such a manner as to leave a clear field for the incision of the meatus."

As an illustration of how far this overdoing of surgery may be carried, I append a sketch of a case (Fig. 31) which was recently under my care, and had been mutilated as shown by a disciple of Otis. This is overdoing surgery with a vengeance, yet it is but a fair representation of a kind of genito-urinary surgery that is unfortunately so prevalent in this country.

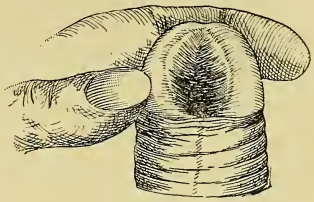


FIG. 31.

A patient with such a meatus loses the fossa navicularis, which Nature has provided as a recepticle for the normal urethral secretions. As a result his meatus is always moist. He is prone to expose his urethra by separating the flaps of the glans penis, in order to observe the normal urethral secretion, to which he attaches pathological importance. Coupled with this he will note that his stream has lost much of its force, and spreads as if it came from a watering-pot. A patient in such a condition is liable to become hipped on the subject, and is often in a most unenviable condition of mind over a pathological state of his urethra, which exists only in his own disordered imagination. But the blame for this unenviable condition rests, nevertheless, on the shoulders of the man who was overzealous in cutting his meatus. It is a fortunate thing that urethral surgeons, from the nature of the work, are practically exempt from malpractice suits, otherwise this would be a prolific field for such cases.

It sometimes happens that it is difficult or impossible to dilate the urethra with sounds to the required extent, owing either to the tenderness of the urethra or the unyielding nature of the urethral callosities. In this case, if further dilatation is absolutely necessary in order to effect a cure, we may have recourse to dilating urethrotomy.

Professor Otis, who, though not the originator of the method, was the first American surgeon to place dilating urethrotomy—by his writings, his instruments, and his results—in an impregnable position, and his name will ever be closely entwined with the history of this operation. It is a pity that the lustre of the name and the



Fig. 32.—The Otis Dilating Urethrotome

brilliancy of the operation should be dimmed by the abuse of this method of treating strictures, which has followed the undue estimation of the importance of stricture of large calibre, and the value of dilating urethrotomy as a means of its cure. The best instrument we can use for this purpose is the Otis dilating urethrotome (Fig. 32), which is based on the correct principle that the stricture tissue should be placed on the stretch at the moment of its incision. Before using the instrument the location of the stricture and the size of the healthy urethra should be ascertained by means of the urethrometre. The urethrotome should be inserted to such a depth that when the knife is raised from its socket it will begin cutting at the deep or posterior aspect of the strict-

ure. The dilating blades of the instrument should be separated until the stricture tissue is put on the stretch, when the knife should be drawn through it from behind forward, and then thrust back into its socket again. If the first incision does not permit of the proper dilatation of the urethra, the dilating blades should be separated still further and the incision repeated. Otis places much importance, from a curative point of view, in completely dividing the stricture.

When we consider that in its longitudinal direction the urethra is a variable quantity; that a slight difference in the traction made on it may make a very perceptible difference on the location of the stricture; that this error may be magnified in inserting the urethrotome; that the urethrotome most commonly used (the Otis) alters its position in the urethra during the process of being dilated—we will readily see that the exact localization of the knife at the point of stricture is matter of considerable difficulty and uncertainty.

In practice it is necessary, in order to be certain of cutting the whole length of the stricture, to make the incision longer than the stricture, and herein lies the greatest danger of urethrotomy, the cutting of the healthy urethra, which is not only more vascular, but its walls are also thinner than at the strictured portion, and its incision is consequently more liable to be followed by dangerous hemorrhage and extravasation of urine.

The incision should always be made on the roof of the urethra, for in this situation extravasation is least liable to occur. After the operation of internal urethrotomy urethral dilatation should be maintained by the passage of sounds until the incision has healed.

As this operation lays open tissues capable of absorb-

ing septic material, the instruments should be above suspicion, and the urethra uncontaminated as far as diligent antiseptic irrigation will render and maintain it. If the urine is healthy it is non-irritating and may be disregarded, provided extravasation does not take place. If extravasation of the urine occurs, it is very liable to undergo decomposition, which converts it from a harmless to a most irritating and destructive agent, capable of blighting whatever it comes in contact with. If the urine has already undergone decomposition within the bladder, antiseptic treatment should be adopted, to purge from that viscus the bacterial ferments which render the urine so noxious, before urethrotomy should be attempted.

A few words may be said about the curative effect of urethrotomy on stricture. It has been often asserted that if a stricture is completely severed absorption of the sundered cicatricial tissue will follow, and by this process of absorption a permanent cure will ensue. My personal experience does not warrant me in holding this opinion. I can readily understand how the inflammatory infiltration in a recently inflamed urethra may, if the exudates have not undergone organization, become absorbed and the urethra be restored to its normal calibre. I can understand how a stricture which has ceased to contract may, after it is cut, show but little tendency to recontraction, as there would only be contraction from the splice of new material that occupied the gap formed by the incision. I can understand how a contracting stricture may be cured by dilatation and keeping it dilated until it has ceased to contract, for even the contraction of cicatricial tissue has an end. I can readily understand all this, but why a simple incision will cause the absorption of cicatricial tissue is beyond my comprehension, and if

it will do so in the urethra why will it not do so in other situations? It seems irrational to me, and contrary to the laws of pathology, which, I fear, have been too much ignored by many urethral surgeons.

The failures of urethrotomy to cure strictures are too numerous to be ignored, and the explanation that "without complete and absolute sundering of the stricture to its ultimate fibre recontraction sooner or later is certain" (Otis, "Stricture of the Male Urethra," page 233), is too unreasonable to be even considered as a loophole of escape out of an embarrassing dilemma.

Aside from the failure of urethrotomy to cure stricture there are other objections too serious to be ignored.

Chordee is a frequent sequence of urethrotomy. In many cases this is but temporary, but in a respectable minority the condition is a permanent one. If we examine a urethra that has been cut we will see a longitudinal splice of cicatricial tissue that is pale and almost bloodless. If the cicatricial tissue extends deep enough to penetrate the cavernous tissue, chordee will ensue because this tissue bears no resemblance to erectile tissue, and is incapable of extension during erection. A bending downward of the penis at the point of stricture, frequently accompanied by dragging pains, will therefore be the unpleasant accompaniment of an erection, and in severe cases may render the patient impotent.

The failure of urethrotomy to cure stricture, and its liability to be followed by chordee, are but trivial objections when compared with the risk attendant upon the operation itself. It has been asserted that this operation has no mortality, but this is a false assertion, and those that have often asserted it the loudest have been aware of its falsity.

The following, on this subject, is quoted verbatim from J. William White's article on "Stricture of the Urethra," in Morrow's "System of Genito-urinary Diseases," vol. i., page 298:

"It must be remembered that no special advantage is claimed for this operation unless it is extensive, the figures of Otis being usually adopted by the few practitioners who habitually employ urethrotomy in stricture of large calibre in which no contra-indication exists to the method of dilatation above described. As to the mortality, Watson's figures (collected by an advocate of this operation) (*Boston Medical and Surgical Journal*, December 29, 1887) show fifty-one deaths in twenty-five hundred and forty cases, or two per cent.; but they include the statistics of all the extremists, whose operations were often on physiological narrowings, and therefore in patients with sound urinary tracts. There is not a more able or more skilful genito-urinary surgeon in Europe than Guyon, and his experience is enormous, but we find that he had twenty deaths in four hundred and fifty-nine operations, or about 4.1 per cent. Stein places the mortality of internal urethrotomy of the penile urethra at from two to five per cent. ('Trans. of the American Association of Genito-urinary Surgeons, 1889'). Thompson had six deaths in four hundred and thirty operations.

"A review of a large number of reported cases, and familiarity with a considerable number even less favorable and not reported, lead me to believe that these figures rather underestimate the mortality, and that the practitioner who decides to cut a stricture anterior to the bulbo-membranous junction must do so with the full knowledge that there are at the least two chances in the hundred of losing his patient.

"There should certainly be definite and well-grounded reasons for accepting this risk, and the operation which involves it should show results unmistakably superior to those of gradual dilatation—a procedure with practically no mortality at all."

The conservative surgeon who takes a rational view of the pathology of chronic urethritis will rarely find it necessary to tell his patient that in order to be cured of this malady he must submit to an operation that kills once in fifty times.

I protest against the teaching that the existence or continuance of a gleet is dependent upon the presence of a stricture. I protest against the teaching that every irregularity in the urethra is a stricture, and in the presence of a gleet should be removed. I protest, most of all, against the reckless urethrotomies that are being done, every day, for the removal of irregularities in the dilated urethra that are in themselves harmless.

Much of this work is done by incompetent men; men who are specialists in its narrowest form; men who will fearlessly mutilate a canal where they cannot see the havoc they are doing, and yet would shrink from the responsibilities of a herniotomy or tracheotomy. Truly "fools rush in where angels fear to tread."

In a recent work on "Stricture of the Urethra" there appears the following: "I presume that there are many skilful men who would claim that a patient who takes a thirty to thirty-five French sound has no stricture. *Yet a patient may take a forty French sound and the case still demand urethrotomy.*" The writer who penned this must either be ignorant of the risks of the operation he recommends, or else wilfully oblivious to the safety and welfare of his patients. Yet this is but a sample among many of the length to which extremists are often carried by their peculiar views on stricture, and were it not that I feel keenly not only the prevalence, but also the danger of this teaching, this work would never have been written.

I feel that an explanation is due the reader in appar-

ently permitting the subject of the treatment of chronic urethritis to lapse from view, in order to condemn indiscriminate urethrotomy, but I may defend my course by stating that it is in the treatment of chronic urethritis that so many needless urethrotomies are done for the cure of imaginary strictures, to which a pathogenic importance is attached, and it is for this reason that I have gone into the subject of urethrotomy in this chapter, instead of reserving it for consideration in the chapter on the treatment of stricture. We must not, however, commit the error of relying exclusively on the use of the sounds, or gradual dilatation as a means of treating chronic urethritis. The method which will give the best results in the majority of cases is one which combines the gentle passage of the sounds, together with the application to the inflamed areas of astringent or slightly caustic remedies. The number of remedies that have been used in the treatment of this malady are legion, and as even an attempt to discuss them would be almost interminable, as well as most unprofitable, I prefer to give, instead, a *résumé* of the method of treatment which I find in my own practice to give the best results.

We will take, for the purpose of illustration, a patient who has a long-standing chronic urethritis which has gone through the usual routine of treatment by injections, by sounds, and by internal medication, with the result that he is sometimes better and sometimes worse, but never entirely well. We will also suppose that he applies for treatment during one of the exacerbations of his urethritis. At this stage or during the exacerbation, it would be highly injudicious to make an instrumental exploration of his urethra. The patient will probably, in his anxiety to get well, insist that this be done, but

his importunities should not be yielded to, for doing so would simply aggravate the existing exacerbation without deriving any commensurate benefit from a diagnostic or therapeutic point of view. The history of the case should be obtained and an examination of the urine made, to determine whether the disease is limited to the anterior urethra, or is complicated by a posterior urethritis. If the inflammatory disturbance is intense and urination painful, some of the balsamic mixtures are prescribed (page 32), or a simple alkaline mixture may be given, if the patient, who is by this time an authority on the subject, volunteers the information that he stands the balsams badly. If the exacerbation is a mild one we may content ourselves by telling the patient to drink freely of water; plain water serves the purpose very well, but the alkaline mineral waters are to be preferred, such as the Bethesda or the Vichy. An injection like the following should be prescribed:

℞ Zinci sulphatis ..... gr. xv.
Plumbi acetatis ..... gr. xxx.
Aquæ rosæ ..... f ʒ vj.
Tincturæ catechu,
Tincturæ opii ..... āā f ʒ j.

This should be used three or four times a day and gradually diminished in frequency as the discharge lessens, until it is only used at bedtime, or discontinued altogether, as may be considered advisable. It is not a good plan to continue the same injection for a prolonged period as the urethra seems to become habituated to it, and a change is necessary. The method of performing the injection has already been described in the chapter on the treatment of acute urethritis, and need not be dwelt upon at the present time. In a few days the exacerbation will have subsided. This will be indicated by

a reduction of the discharge to the morning-drop, and the almost total disappearance of the mucus in the first part of the urine. Pain on urination, if previously present, will also have disappeared. When this stage has been entered upon, or if this is the condition of the urethra when the patient first applies for treatment, the internal administration of remedies should be discontinued or ignored, unless the urine is unduly acid; or the patient is anæmic and depressed in health, or if there is present a constitutional dyscrasia, such as syphilis or tuberculosis; or if the patient has a rheumatic, lithæmic, or gouty diathesis; or is a dyspeptic. Any of these conditions may exert an unfavorable influence on the progress of a chronic urethritis, and if present, should receive vigorous treatment. The point to be emphasized is that in the treatment of the urethra we should not be mere specialists, but should look at the patient from the broad stand-point of the physician, instead of seeing him only through his urethra.

Granted, however, that in the hypothetical case under consideration there is only the urethra to deal with and that the time for its local treatment is ripe, the first thing to be done is to pass a sound the full size of the urethra. If the meatus is noticeably narrow and offers an impediment to the passage of the sounds, it should be cut on its floor, with a knife or the obstructing fold of mucocutaneous tissue may be snipped with a pair of scissors. The incision, however, should be only large enough to readily admit of the passage of the largest sound which we estimate will be passed into the urethra.

The passage of the sound is followed by an endoscopic examination to determine the nature, extent, and location of the urethral lesions, and to permit of the local applica-

tion of remedial agents to the inflamed areas. For this purpose an endoscopic tube a little smaller than the sound that has been passed is selected, and passed into the urethra. If the history of the case and the results of the examination of the urine excludes the implication of the posterior urethra, in the inflammatory process, the tube need not be inserted farther than the membranous urethra, otherwise it should be inserted to the vesical orifice and the urethra inspected as the instrument is withdrawn. If the caput gallinaginis is swollen and inflamed its surface is swabbed with a solution of nitrate of silver varying in strength from twenty to sixty grains to the ounce. The first application should be weak, the stronger solution being held in reserve until the effect of the weak application has been observed. As the endoscope is withdrawn, patches of granulation tissue, as they appear, should be freely touched with the silver solution. Simple catarrhal areas should only be lightly touched with a weak solution.

It is necessary to guard against applying the solution too freely, as harm may be done by the superfluous solution extending beyond the intended limits and implicating healthy areas. The swab consists of a piece of match-wood cut to the proper length and tipped with cotton. These sticks may be obtained at any match-factory; they are inexpensive and should be destroyed as soon as used. I use in preference to the match-wood willow rods cut to the proper length; they are tougher than match-wood, and cut with a rough end that facilitates the fixation of the cotton; they may be obtained of the proper size at any place where street-sweepers are made or repaired.

Having completed the endoscopic examination and treatment, and made a note of the results, the patient is

directed to use, two or three times daily, a mild injection, and is requested to return on the third or fourth day for a renewal of the treatment. In some cases further endoscopic treatment is unnecessary, although this is exceptional, as I am partial to this method of treatment. It frequently happens that at first we must devote our whole energies to the restoration of the urethra to its normal resiliency and calibre. In other words, we must promote the absorption of chronic inflammatory exudates. This is accomplished by gradual dilatation, assisted in rare cases by internal urethrotomy.

A solution of iodine, one part ; iodide of potassium, ten parts ; and glycerin, one hundred parts, is of great value in facilitating the absorption of urethral exudations, if it is painted over the indurated areas. An ointment of adeps lanæ hydrosus, U. S. P., containing nitrate of silver, may be advantageously used instead of the solution of the latter. It has the advantage that its action on the urethra is more prolonged, and the wool-fat tends to promote the absorption of the silver. A solution of sulphate of copper, 1 to 20, is often used by some surgeons as a substitute for the silver solution ; it is sometimes advantageous to alternate the use of the silver and copper.

The above method of treatment cannot be followed in every case. There are certain individuals whose urethra is always too sensitive to permit of endoscopic manipulation, and in such cases we may resort to deep urethral injections, using the common deep urethral syringe. Where this is used a much weaker solution must be applied than by the endoscopic method, as it is difficult to limit the distribution of the fluid which usually traverses areas where the urethra is healthy. Thus a very few drops placed in the bulbous

urethra will be squeezed forward by the collapsing of the urethra, until it escapes at the meatus. This method is particularly valuable in the treatment of the posterior urethra, but has also a limited application in the anterior urethra.

There is considerable routine about this treatment, in defence of which I may plead that almost every one's experience ultimately brings him to a point where he uses but few remedies, which the test of time and experience has shown to be the most reliable, and nitrate of silver seems to be the remedy *par excellence* for the treatment of chronic inflammation of the mucous membranes, wherever its application can be made, and is in constant use for this purpose by the ophthalmologist and laryngologist, as well as by the genito-urinary surgeon.

We may briefly sum up the treatment of chronic urethritis as follows:

Local treatment should not be attempted during an exacerbation of the inflammation. The urethra should be restored to its normal calibre and resiliency by gradual dilatation with sounds. The meatus should be cut if necessary, but internal urethrotomy should be avoided when possible, on account of its mortality. If the urethra is not too sensitive, local treatment with the endoscope should be employed in conjunction with gradual dilatation. Injections may or may not be used throughout the treatment, their use being determined to a great extent by the degree of catarrhal inflammation that may be associated with the other lesions of the urethra.

In conclusion, it may be well to sound a note of warning on the subject of overtreatment of the urethra. It not infrequently happens that a chronic inflammation of the urethra is maintained by the very means instituted for

its removal. Following the local treatment of the urethra there may be an undue amount of inflammatory reaction. If in such a case the treatment is repeated before the subsidence of the reaction it will be readily seen how the condition may be aggravated instead of benefited. In the treatment of chronic urethritis, if the disease makes unsatisfactory progress without an obvious cause for so doing, it is the part of wisdom to abandon for a time all local treatment and watch the progress of the case, aided only by such internal remedies as will serve to keep the urine from being in itself an irritant. It may be well to once more remind the reader that many cases of chronic urethritis do badly because there is a constitutional dyscrasia or diathesis present, whose treatment and correction is as important for the cure of the diseased urethra as is the treatment of the urethra itself. There is a variety of chronic urethritis sometimes seen which deserves special mention because of its peculiar obstinacy in yielding to the ordinary modes of treatment. It is usually met with in those who, while apparently enjoying good health, are, nevertheless, very susceptible to catarrhal affections. If such a patient contracts a gonorrhœa it is prone to become chronic, but differs from the ordinary chronic urethritis in the fact that it continues to secrete a profuse purulent discharge, which may be equally as abundant as in the acute attack, but is not associated with the inflammatory symptoms of the latter. In these cases the best results are obtained from daily irrigations of the urethra with a solution of nitrate of silver 1 to 1,500, potassium permanganate 1 to 1,000, or a solution of bichloride of mercury 1 to 15,000, using the apparatus shown in Fig. 11.

It is probable in these cases that in addition to the gonococci other pyogenic micro-organisms luxuriate in

the urethral mucosa. When the free discharge has been subdued these cases are amenable to the ordinary modes of treatment, but under any circumstances they are, to say the least, unsatisfactory.

One of the most difficult questions to answer is, when is a patient who has had a gonorrhœa, acute or chronic, justified in resuming sexual intercourse? This question is frequently propounded, and the physician who answers it assumes a serious responsibility. Mistakes on his part are not always avoidable, and when made are liable to be followed by serious reflections by the patient on the accuracy of his judgment. Extreme caution should therefore be exercised in this matter. If the patient is just recovering from an acute attack of gonorrhœa, intercourse is out of the question if there is the least discharge, and for some time afterward—long enough to be sure that there will be no relapse. The greatest difficulty, however, is experienced in determining the infectiousness of chronic urethral discharges. We cannot apply the same sweeping rule in this case that we do in acute urethritis; for many chronic urethral discharges are not infectious, and forbidding a patient to assume marital relationship on the ground of the existence of a discharge, or the presence of urethral threads in the urine, would often entail needless disappointment and frequently disrupt conjugal relationship. It goes without saying that if the discharge contain gonococci it is infectious. This point cannot, however, be always easily determined. Repeated examinations may give negative results, and yet the gonococci be present, but in such scant numbers as to escape detection. It has been observed that the discharge during the exacerbation of a chronic urethritis contain gonococci in much greater numbers than during the period of qui-

escence. This is made use of by purposely exciting an exacerbation, and then examining the discharge, an injection of nitrate of silver, or preferably a strong solution of bichloride of mercury, on account of its destructive influence on extraneous micro-organisms, is used for this purpose. Repeated microscopic examinations are necessary before we can positively state that gonococci are absent from the secretion. Finger refuses to sanction intercourse as long as pus corpuscles are found in the secretion. It will be seen therefore that this subject is not an easy one to settle, and the physician will pursue the wisest course who, in case of doubt, either advises against intercourse or refuses to accept the responsibility, if the patient is determined to decide the matter for himself.

It may be of service to append the results of the elaborate researches by Professor Goll on 1,046 cases, showing the period at which gonococci were found. The secretion from each of these cases of urethritis were examined from three to fourteen times:

Duration since Infection.	Number of cases.	Gonococci found.	Negative results.	Percentage of occurrence of gonococci.
4 to 5 weeks	85	40	45	47
6 "	54	21	33	38
7 "	35	11	24	31
2 months	75	15	60	20
3 "	76	13	63	17
4 "	62	13	49	21
5 "	43	8	35	18
6 "	55	8	47	14
7, 8, 9 "	108	21	87	19
1 year	83	12	71	14
1½ "	76	7	69	9
2 years	135	7	128	5
3 "	80	2	78	2½
4 "	37	....	37	....
5 "	20	....	20	....
6 and more years	22	....	22	....

CHAPTER XI.

THE POSTERIOR URETHRA.

Anatomy.

The posterior urethra, the deep urethra, the prostatic urethra, and the neck of the bladder are almost synonymous terms and are in constant use by the profession. There is, however, a considerable degree of vagueness regarding the functions of the part which has received the names given above, and a still greater lack of appreciation of the importance of the diseases to which this part of the urethra is liable.

In order to appreciate the latter it is of the first importance that we understand the former, therefore no apology is needed if, in the preamble to the diseases of the posterior urethra, the anatomical and physiological part of the subject be detailed at length, although part of it has already been described in the first part of this work.

The urethra is divided anatomically into the pendulous, the bulbous, the membranous, and the prostatic portions, but in the consideration of its disease we will ignore the anatomical classification and adhere to the clinical division of an anterior and a posterior urethra, for we find that the diseases of the urethra are, to a certain degree, limited to either the anterior or the posterior portions of the urethra, and when a disease extends

from one division to the other, the extension is often manifested by the onset of an entirely new group of symptoms. The reason for this clinical division is a purely anatomical one, namely, the arrangement of the circular muscular fibres of the urethra, which prevade the entire submucous tissue, but which at certain points are collected into distinct bundles, which grasp the urethra more or less tightly and act as a barrier to the passage beyond it of the contents of the bladder or of the urethral secretions. It is of the highest importance that we understand the arrangement of these muscular bands, which is as follows: At the vesical orifice of the urethra there is a bundle of unstriated circular muscular fibres which surrounds the urethra. This muscle is called the internal sphincter of the bladder, and serves when the bladder is not distended to prevent the passage of the urine into the urethra. As the bladder becomes distended the tension on its walls acting on the fixed point, namely, the vesical orifice of the urethra, tends to pull the latter open (Fig. 33). Up to a certain point the internal sphincter is able to withstand the pull of the bladder, but it is a weak muscle, and yields just as soon as the bladder is well filled, when the contents of the latter leak into the posterior urethra, and were we dependent solely on this muscle for the retention of the urine, dribbling would take

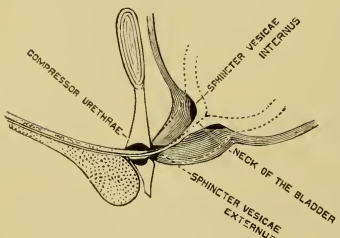


FIG. 33.—Diagram Showing the Muscles of the Posterior Urethra, and the Effect of a Distended Bladder on the Internal Sphincter.

place. Fortunately, however, there is another and stronger sphincter, which has also the additional advantage that it is partly under the control of the will, so that it can be voluntarily increased or diminished in force as occasion demands. This muscle is called the external sphincter, and is composed of two circular bands which surround the urethra at, and immediately in front of, the apex of the prostate gland.

The first is a band of striated and non-striated muscular fibres, situated at the apex of the prostate. The second is called the compressor urethra. It is a voluntary or striated muscle, and lies between the two layers of the triangular ligament, to which and to the ischiopubic rami on either side it is attached. Weaving itself, in various directions, above, below, and around the membranous urethra, it forms, with the circular muscle situated at the apex of the prostate, the external sphincter of the bladder. This sphincter is much more powerful than the internal sphincter, and therefore offers a greater resistance to the passage beyond it of either the contents of the bladder or of the urethral secretions, and to this fact the clinical division of the urethra into anterior and posterior portions is due. That part lying in front of the external sphincter is called the anterior urethra, and that portion lying posterior to the external sphincter is called the posterior urethra.

The external sphincter, which so firmly grasps the membranous portion of the urethra, acts as a barrier to the passage backward beyond this point of the secretions from the anterior portion of the urethra. In gonorrhœa it is chiefly through the medium of the urethral secretion that the disease extends along the urethra, therefore this disease, as a rule, does not extend

beyond the external sphincter. When, however, from any cause the gonorrhœal process extends beyond this point, there is nothing to prevent the invasion of the entire posterior urethra, since the external sphincter will not permit the escape forward of the infective secretion; the only escape for it, if abundant, is backward, through the weak internal sphincter, into the bladder. If, however the secretion is scant it may simply collect in the posterior urethra, until washed out in the act of urination. The important point to remember in this connection is that in an inflammation limited to the posterior urethra, the discharge does not escape forward but backward toward the bladder. A posterior urethritis may therefore exist without any visible discharge, except such as may be detected by an examination of the urine.

The importance of understanding the muscular arrangement of the posterior urethra is, perhaps, from a clinical stand-point, of less value than the appreciation of its sensory and sexual functions.

The posterior urethra is the most sensitive portion of the whole urinary tract to the stimulus to urinate. If a sound is passed along the urethra, the moment it enters the prostatic portion it gives rise to an intense desire to urinate, even if the bladder is empty, while if the instrument be inserted into the bladder, its contact with the latter does not perceptibly increase the desire. If a weak solution of nitrate of silver be injected into the anterior urethra, it gives rise to a burning sensation, without any accompanying desire to urinate; but if the same solution be injected into the posterior urethra, the desire to urinate predominates over the burning feeling. Pressure of the finger within the rectum against the prostatic urethra gives rise to the desire to urinate.

Under normal conditions the stimulus to urinate only arises when the bladder is full, and a little of the urine has escaped past the weak internal sphincter into the posterior urethra, where its presence sets up the desire to urinate. If the bladder becomes much distended, the posterior urethra virtually forms a part of the bladder, since it freely communicates with the latter (Fig. 33), and under these circumstances is deserving of the appellation so frequently given, "neck of the bladder." When this takes place the control of the urine depends entirely on the grasp of the external sphincter, which may require a constant volitional impulse to enable it to withstand the force of the detrusor muscles of the bladder.

When the bladder is distended it can readily be shown that the posterior urethra forms a portion of the bladder by inserting a catheter, with the eye on the tip, just beyond the compressor urethra, when the urine will begin to flow and continue until the distention of the bladder is relieved. The bladder, however, can only be completely emptied by inserting the tip of the catheter beyond the internal meatus, thus demonstrating that when the bladder is not distended it is shut off from the posterior urethra.

It will be readily understood, therefore, why it is that in all affections of the posterior urethra which increase its sensibility frequent micturition is a prominent symptom. If the sensibility is very acute, simple contact of the vesical orifice of the urethra with the contents of the bladder will give rise to an intense desire to urinate, as may be witnessed in acute posterior urethritis of gonorrhœal origin, often miscalled gonorrhœal cystitis. It often happens, however, in these cases that the vesical aspect of the internal meatus is inflamed, and in such

cases the desire to urinate will be felt before any urine has leaked into the posterior urethra. The same desire to urinate is often observed in persons suffering from vesical calculus. When in the erect position the stone gravitates against the neck of the bladder and frequent micturition is the result; while if he be in the recumbent position the stone gravitates away from the neck of the bladder, and micturition becomes less frequent.

When the hyperæsthesia of the posterior urethra is less acute, as in chronic catarrhal affections, the desire to urinate may not be abnormally frequent, the stimulus not originating until the distended bladder has dilated the internal sphincter and the urine has leaked into the posterior urethra, but when this has taken place the desire to urinate is more urgent than normal, and the patients will frequently make this the chief burden of their complaints.

Aside from its relationship to the act of micturition the posterior urethra bears a no less important relation to the sexual and nervous systems. On its floor are the terminal openings of the ejaculatory ducts as well as a number of prostatic glands, whose secretion is intimately associated with the sexual act. These ducts and glands not infrequently participate in the inflammatory diseases of the posterior urethra, setting up, by a process of extension, an epididymitis or a prostatitis, as the case may be. Of still greater importance to the urethral surgeon is the peculiar elevation on the floor of the prostatic urethra, called the caput gallinaginis (Fig. 34). It projects about an eighth of an inch from the floor of the urethra, and is composed of mucous membrane and erectile tissue. The ejaculatory ducts open on the anterior aspect of its

lateral borders. Within it, in a direction downward and backward, is the sinus pocularis, a cul-de-sac about a

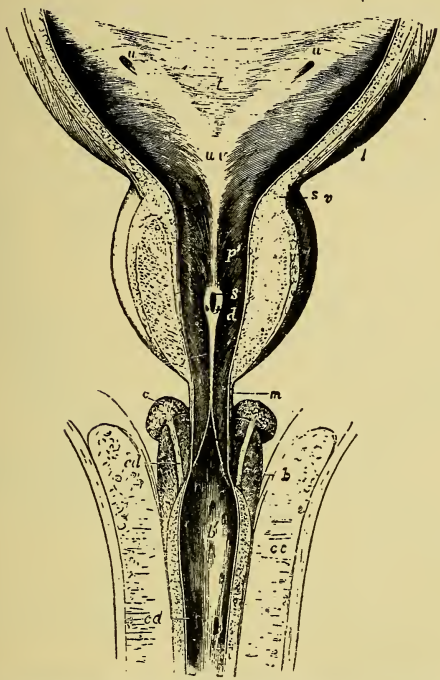


FIG. 34.—The Lower Part of the Bladder, and the Prostatic, Membranous, and Bulbous Parts of the Urethra, Opened from Above. (Allen Thompson.)

quarter of an inch in length, which is the analogue in the male of the uterine cavity in the female.

It is important, in order to understand many of the phenomena manifested in diseased conditions of the posterior urethra and prostate gland, that we appreciate

the analogous relations of the male and female organs of generation. For this purpose the accompanying diagrams are given. In Fig. 35 the common genital organs before the differentiation of sex is portrayed. In Fig. 36 the female genital organs are shown to be developed from the ducts of Muller, the free extremity forming the Fallopian tubes, the coalesced portion forming the uterus and vagina. In Fig. 37 the ducts of Muller play a much less important *rôle*, and are entirely obliterated except

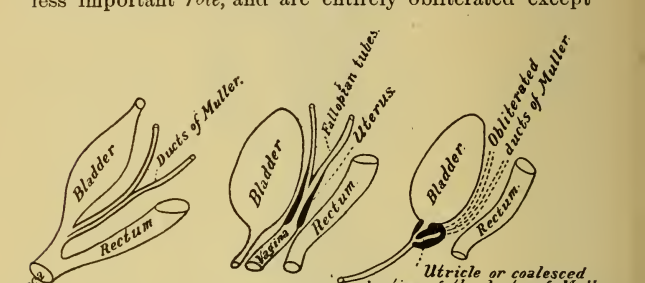


FIG. 35. FIG. 36. FIG. 37.

at the lower extremity, where they coalesce to form the utricle or sinus pocularis, the wall of the tubes forming the prostate gland.

In the infantile urethra the caput gallinaginis and utricle are much larger proportionately than in the adult urethra. In Fig. 38 the development of the organs of generation is shown in detail.

The prostate gland, especially in the neighborhood of the urethra and caput gallinaginis, is very rich in nerves containing ganglia and Pacinian corpuscles, which are usually only found in very sensitive organs. Like the

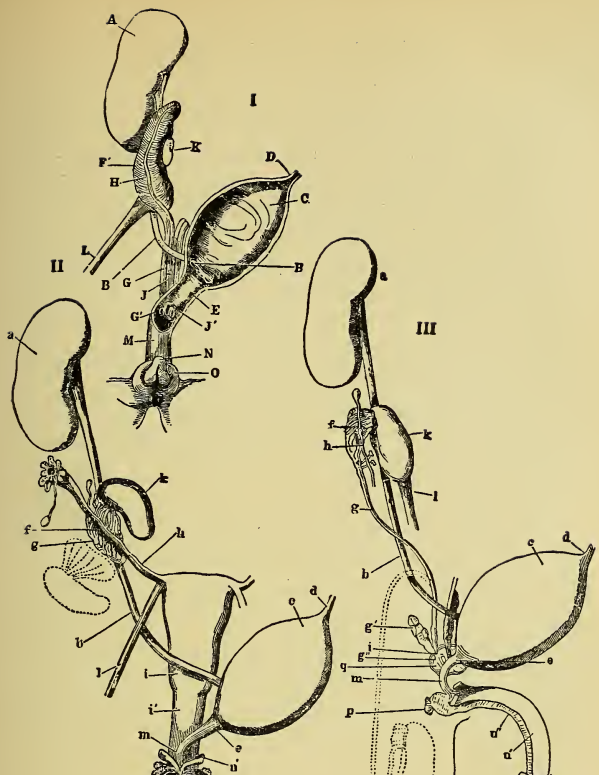


FIG. 38.—Diagrammatic Representation of the Development of the Genito-urinary Apparatus. (Henle.)

I, Embryonic condition, in which there is no distinction of sex; II, female form; III, male form. The dotted lines in II and III represent the situations which the male and female genital organs assume after the descent of the ovaries and testicles. The small letters in II and III correspond to the capital letters in I.

I.—A, kidney; B, ureter; C, bladder; D, urachus, developed into the median ligament of the bladder; E, constriction which becomes the urethra; F′, Wolffian body; G, Wolffian duct, with its opening below, G′; H, duct of Muller, united below, from the two sides into a single tube, J, which presents a single opening, J′, between the openings of the Wolffian ducts; K, ovary or testicle; L, gubernaculum testis or round ligament of the uterus; M, genito urinary sinus; N, O, external genitalia.—II (Female). a, kidney; b, ureter; c, bladder; d. urachus; e, urethra; f, remains of the Wolffian body (parovarium); g, remnant of the Wolffian duct; h, Fallopian tube; i, uterus; i′, vagina; k, ovary; l, round ligament of the uterus; m. extremity of the urethra; n. clitoris; n′, corpus cavernosum of the clitoris; n″, bulb of the vestibule; o, external genital opening; p, excretory duct of the gland of Bartholinus.—III (Male), a, kidney; b, ureter; c, bladder; d, urachus; e, urethra; f, epididymis; g, vas deferens; g′, seminal vesicle; g″, ejaculatory duct; h, i, remains of the duct of Muller; k, testicle; l, gubernaculum testis; n, n′, n″, urethra and penis; o, scrotum; p, gland of Cowper; q, prostate.

uterus it is supplied by the hypogastric plexus of the sympathetic and pudendal plexus of the sacral nerves. The pudic nerve, a branch of the sacral plexus, is distributed to the urethra, glans penis, and sphincter ani; it also supplies the integument of the penis, scrotum, and perineum. The identity in nervous supply explains the relationship between the pain felt in the glans penis as the result of irritation of the neck of the bladder, and the teasing neuralgic pains that are often felt in the integument over the pubes, scrotum, perineum, and thighs, as the reflex manifestations of an unhealthy posterior urethra. The sphincter ani and compressor urethræ being supplied by the same nerve, the intimate association of retention of urine with operations on the rectum is readily explained.

The prostate gland and uterus bear a close relationship to each other, since they are developed from similar rudimentary organs, resemble each other in structure, and are identical in their nervous supply. It is not to be wondered, therefore, that in some respects they are susceptible to similar diseases, the reflex manifestations of which, in the male as in the female, often border on the hysterical.

CHAPTER XII.

ACUTE POSTERIOR URETHRITIS.

Etiology.

Before we realized the clinical distinctions between the diseases of the anterior and posterior urethra, posterior urethritis was not recognized as an entity, this disease being referred to the bladder although occasionally an attempt was made to localize it to the neck of the bladder, the latter, in the professional mind, vaguely consisting of a prolongation of the bladder which connected it with the urethra. On the other hand on the recognition of the sharp anatomical and clinical division of the urethra into anterior and posterior portions, there was a tendency to divorce their diseases, a procedure which to a certain extent was justified by the diversity of the symptoms and operative treatment of the diseases of these two portions of the urethra and still holds good in so far as it seems advisable to treat of their diseases separately.

It is probable that an error has been committed in failing to recognize the presence of some of the milder inflammations of the posterior urethra when associated with acute anterior urethritis, and in failing to recognize that acute posterior urethritis is often not sharply limited posteriorly to the internal meatus, but may involve its vesical aspect, particularly in the neighborhood of the trigone.

There is at the present time a growing tendency to the belief that acute posterior urethritis is such a common concomitant of acute anterior urethritis that it should be considered exceptional when it does not accompany the latter disease. The advocates of this theory claim that the disease is often overlooked and the frequency of its occurrence much underestimated, and also that it appears much earlier in the course of acute anterior urethritis than has generally been supposed. Statistics have been given to show that in eighty per cent. of cases of acute anterior urethritis a posterior urethritis is also present. To account for this surprising statement the theory has been advanced that infection of the whole urethra takes place within a day or two of the onset of the disease, by means of the lymphatics, extension on the free surface, or by continuity of tissue holding a minor position in the *rôle* of infective channels.

I am perfectly willing, as will be shown later, to concede the frequency of chronic posterior urethritis, but neither the experience I have had, nor the investigations I have made, warrant me in entertaining the belief that this disease is nearly as frequent a sequence of acute anterior urethritis as is indicated above. If we believe that infection of the deeper portions of the urethra takes place through the medium of the lymphatics, then we can readily conceive that the posterior urethra would rarely escape infection; but, believing in neither, I must hold that acute posterior urethritis should be regarded as a complication, not as an essential part of a gonorrhœa. In fact it must be considered the most serious complication liable to arise in the course of acute anterior urethritis, since it is a necessary forerunner of gonorrhœal epididymitis, cystitis, and pyelitis.

Nature has interposed a barrier between the anterior and posterior urethra in the tonic contraction of the muscles which grasp the urethra as it passes between the layers of the triangular ligament. That this barrier is not an impermeable one is evident from the fact that the secretion containing the gonococci will often, in spite of all precautions, pass the barrier and infect the deep urethra. It is not until after the gonococci have invaded the entire length of the anterior urethra, which is usually in the third week of the disease, that the posterior urethra becomes infected. Injections in the early stages of a gonorrhœa, or the passage of instruments, may carry the gonococci-laden pus to the deep urethra, before the invasion of the anterior urethra is complete. This is one of the most serious objections to the use of injections, or the passage of instruments, early in the disease, for it has been observed that posterior urethritis not only occurs earlier, but also oftener, under such circumstances.

The moment the gonococci have succeeded in passing the natural barrier between the anterior and posterior urethra there is nothing to prevent the rapid infection of the whole posterior urethra, *for the point of least resistance is toward the bladder, in which direction the infective secretion rapidly travels, contaminating the urethra in its course.*

The acme of posterior urethritis is therefore rapidly reached, and the period of decline is usually established at a much earlier period, dating from their respective inceptions, than is acute anterior urethritis. Acute posterior urethritis, however, is more liable than acute anterior urethritis to lapse into the chronic stage.

When an anterior urethritis is complicated by a posterior urethritis the intensity of the former usually rapidly decreases synchronously with the development of

the latter. Why such should be the case is difficult of explanation, but it is not without a parallel. It is a matter of common observation that the development of a tubercular abscess in one situation will check the progress of a tubercular lesion in another; or the development of pulmonary tuberculosis will frequently arrest the progress of a pre-existing tubercular disease of the bones. It is not uncommon, on the other hand, for the subsidence of a posterior urethritis to be marked by an exacerbation of the inflammation in the anterior urethra. Why this should be so has not received a satisfactory solution, and must therefore be left an open question.

The intensity of a posterior urethritis is very variable. It may be equally as violent as in the anterior urethra, and associated with much more distressing symptoms. More often it is of a milder grade, being subacute or chronic from the beginning.

If infection of a posterior urethra takes place early in the course of a gonorrhœa, it is liable to be acute and associated with violent symptoms; if infection takes place late in the course of a gonorrhœa it is usually subacute, and often associated with symptoms so mild that the disease may be overlooked. The variation in the intensity of the inflammation in these cases is probably due to a difference in the virility of the gonococci. When infection takes place early, the gonococci are more virulent than at a latter stage, when the gonococci have been weakened by the propagation of successive generations in the same soil.

Acute posterior urethritis is rarely met with except as a sequence of a gonorrhœa; it may be caused by violent instrumentation, such as the clumsy passage of the sound or catheter, or by the impaction of a small calculus in the

prostatic urethra, or it may be inflamed in acute prostatitis, but these cases form such a small part of the whole that they need not be considered in the present article, which deals chiefly with the diseases of the urethra that are due to infection.

The period at which a posterior urethritis may develop in a gonorrhœa will vary very much, its onset and the time of its appearance depending to a great extent on the form of treatment to which the anterior urethra has been subjected, being not only more frequent, but also appearing earlier, when injections or instrumental treatment is instituted, than when local treatment is avoided. It will be found that the majority of cases do not develop until after the gonorrhœal inflammation has extended to the bulbous portion of the urethra; this will usually be found between the second and fourth week of the disease.

Heissler states that in fifty cases which he observed posterior urethritis occurred—

In the	1st	week	after	infection	in	20	per	cent.
"	"	2d	"	"	"	" 34	"	"
"	"	3d	"	"	"	" 14	"	"
"	"	4th	"	"	"	" 20	"	"

Finger, commenting on this table, remarks that "despite careful observation I have never observed such an early development in cases which were not treated locally."

CHAPTER XIII.

ACUTE POSTERIOR URETHRITIS.

Symptoms.

The symptoms of acute posterior urethritis centre chiefly around the fact that the mucous membrane of the posterior urethra is the most sensitive of the whole urinary tract to the stimulus to urinate. In health the stimulus to urinate arises when the bladder is filled and a drop of urine trickles into the posterior urethra, or neck of the bladder. In disease this sensibility is abnormally acute, so that the ordinary stimulus is increased manifold. Frequent and painful micturition is, therefore, the characteristic symptom of acute posterior urethritis. The intensity of this symptom varies with the grade of the inflammation and the condition of the urine. If the inflammation is very acute, and especially if it has extended to the vesical aspect of the urethral orifice, then the case becomes most distressing. The desire to urinate is constant. No sooner have a few drops of urine collected in the bladder than violent vesical tenesmus sets in, the patient is powerless to restrain the act, and the crowding of the vesical walls against its neck causes not only intense pain, but frequently ruptures the capillaries in the mucous membrane so that a few drops of blood often mark the termination of the act. No sooner has the pain of a spasm subsided than the expectations of relief are rudely shattered by the onset of another spasm, and thus the case goes on, in its pitiable course. Not in-

frequently the swelling of the mucosa or a spasm of the sphincters causes retention of urine, and then we have to deal with a condition that is truly agonizing.

The milder grades of inflammation are associated with correspondingly milder symptoms, which may be manifested less by frequency or pain in urination than by a difficulty in restraining the act when once the desire has arisen. In these cases it is but fair to suppose that the inflammation is not of a severe grade, and has not involved the vesical aspect of the urethral orifice. Between these extremes there may, of course, be various grades of inflammation, the symptoms of which will be readily understood, and need not be entered into.

The diagnosis of posterior urethritis, in the acute stage, can usually be made from the subjective symptoms alone. Given a case of gonorrhœa which, between the second and fourth week, develops the symptom of frequent and painful urination, the diagnosis may be readily made without much further questioning. If, however, there is a doubt in the matter, it can be set at rest by an examination of the urine. For this purpose let the patient pass his urine, preferably the first passed in the morning, into three glasses. If there is only an anterior urethritis present the first glass will be turbid from the fact that the first part of the urine washes out the pus and desquamated epithelium from the anterior urethra. The second vessel will be clear or slightly turbid, if the first urine has not entirely cleansed the urethra. The third glass will be clear because the urine it contains has passed over a urethra that had previously been washed clean.

If, however, there is also an acute posterior urethritis present, the first glass will be turbid. The second will also be turbid, but to a lesser degree, depending on the

severity of the posterior urethritis. The third glass will be slightly turbid, for it will still contain some of the secretion that has passed from the posterior urethra into the bladder. If the inflammation is of a low grade, with scant secretion, or if a short interval has elapsed between the acts of urination, the third, and sometimes the second glass may be clear, for no secretion may have passed backward into the bladder. Any doubt that may exist as to the involvement of the posterior urethra may be settled by first washing out the anterior urethra with an irrigator, and then directing the patient to urinate into two vessels. If pus threads are still present they must come from the posterior urethra, and will be found chiefly or altogether in the first part of the urine.

It sometimes happens that in the expulsion of the last drops of the urine a number of delicate comma-like threads are squeezed out of the prostatic glands. These threads consist of moulds of the glands in the prostate, their appearance and the fact that they settle rapidly to the bottom of the vessel will differentiate them from any secretion derived from the bladder or higher portion of the urinary tract.

A chemical examination of the urine will often reveal much more albumin than can be accounted for by the pus in the urine. This is probably due not to structural changes in the kidney, but to an increased intrapelvic pressure, caused by the vesical spasm.

The pain of posterior urethritis is referred to the perineum, distinguishing it from the pain of cystitis, which is referred to the suprapubic region. A digital examination of the prostate per rectum will usually evince an abnormal tenderness which may amount to a pain if there is marked involvement of its glandular structure.

CHAPTER XIV.

ACUTE POSTERIOR URETHRITIS.

Treatment.

Every case of acute posterior urethritis is a serious one, and the physician and patient should both realize this at the outset. The simplest case may be the forerunner of a prostatitis, an epididymitis, a cystitis, a pyelitis, or a pyelo-nephritis, even the life of the patient may be sacrificed to what at first may seem but a trivial complaint.

The hygienic and dietetic rules laid down to govern the treatment of acute anterior urethritis should be rigorously observed. If the case is of a severe type, absolute rest in bed should be enforced, as a *sine qua non* to further treatment. Motives of secrecy or other causes that justify a patient with an anterior urethritis in following his ordinary vocations must be thrown to the winds, and absolute rest secured at all hazards. This is rarely difficult to enforce, for even to the patient the case assumes such a serious aspect that the physician's orders are strictly obeyed.

The same indications exist for the internal administration of the balsams, ethereal oils, and the alkalies, as in acute anterior urethritis, the urine should be maintained in a neutral or slightly acid condition. An alkaline urine should be avoided, for the reason that it has slightly irritating properties, and also because it facilitates the growth of micro-organisms and the decomposition of the puru-

lent secretion which flows from the posterior urethra into the bladder.

If injections have been employed in the treatment of an associated anterior urethritis they should be immediately discontinued. If the posterior urethritis is acute, this rule should be inflexible, for the importance of a coexisting anterior urethritis dwindles, by comparison, into insignificance, and for the time being its treatment should be ignored.

It is a curious fact, however, as has already been mentioned, that the onset of a posterior urethritis is usually marked by a diminution in the severity of the symptoms of the coexisting anterior urethritis. A valuable adjunct to the treatment already indicated is the use of hot sitz-baths, which may be used from three to six times a day, the water being as hot as can be borne. Injections of hot water into the rectum will also ameliorate the symptoms. The injections should be given with the patient lying on his left side, a quart of water at a temperature ranging from 110° F. to 130° F. should be used.

If the desire to urinate is distressing, and the vesical spasms frequent, anodynes should be freely used, for the ill effects of such remedies on the gastro-intestinal tract is the least of two evils when compared with the injurious effect of constant vesical spasms crowding the tender walls of the neck of the bladder against each other and wearing out the unfortunate patient.

Belladonna, on account of its antispasmodic action, is the remedy most often used, and is usually employed in combination with opium in a suppository as follows:

Extracti opii..... gr. x.
Extracti belladonnæ..... gr. v.
M.—Ft. suppositoriæ, No. 10. Sig.: To be used as directed.

The suppositories should be used sufficiently often to control the pain and spasm. If necessary the patient may be slightly narcotized; care should be taken at the same time to prevent constipation. It is only in exceptional cases that it is necessary to push the anodynes to the point indicated above; as a rule it will be sufficient to use a suppository at bedtime to insure a comfortable night's rest.

When the disease has passed into the subacute stage the balsams and anodynes may, with advantage, be discontinued; the alkalies should, however, be used, if

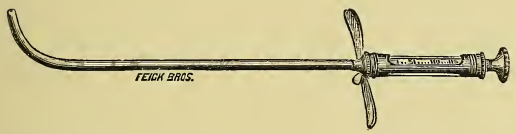


Fig. 39.—Keyes's Deep Urethral Syringe.

necessary to insure a non-irritating urine. In this stage no remedy seems to afford such marked relief or to be so efficacious as the application to the neck of the bladder of a weak solution of nitrate of silver. For this purpose a deep urethral syringe, such as Keyes's or Ultzmann's, should be employed (Fig. 39). About twenty minims of a 1 to 4 grains to the ounce solution of nitrate of silver should be deposited in the anterior portion of the deep urethra, from which point it will rapidly spread along the whole posterior urethra. The superfluous solution which flows backward into the bladder will be neutralized by contact with the chlorides in the urine. The weaker solution should be used tentatively, and the application made with the utmost gentleness, otherwise

the traumatism inflicted will more than counterbalance the beneficial influence of the application.

Immediately after the application there is a temporary increase in the vesical tenesmus which may last from a half to two hours, and should be anticipated, at least at the first application, by the use of a suppository one-half an hour previous to the application. After an interval of a day the application should be repeated. Its strength should be gauged by the severity of the reaction following the previous application. It will be found, however, that succeeding applications can be made stronger without a proportionate increase in the severity of the reaction. In cases that are subacute from the beginning this mode of treatment may be begun at once, for in this stage of the disease it is the sheet-anchor to which we should tie; but it should not be forgotten that it may be an instrument for evil instead of good if infinite gentleness is not used in its manipulation. It is much more difficult to pass a solid instrument of small calibre, such as the deep urethral syringe, than to pass a large instrument like a steel sound, as the former is liable to push the mucous membrane of the urethra in front of it, forming a fold against which the instrument becomes entangled.

As the severity of the symptoms subsides the interval between the injections should be lengthened to from three to five days, and maintained at this period until convalescence is established.

When the disease has passed into the subacute stage the treatment of the anterior urethritis may be resumed.

CHAPTER XV.

CHRONIC POSTERIOR URETHRITIS.

Etiology and Pathology.

Chronic inflammation of the posterior urethra, like chronic inflammation of the anterior urethra, is often a sequence of the acute form of the disease. The acute inflammations of the posterior urethra are, however, more liable to become chronic than are the acute inflammations of the anterior urethra. This may be attributed to several causes, among which we may mention the greater hindrance to the escape of the inflammatory products, which are prone to collect in the posterior urethra, being barred anteriorly by the external prostatic sphincter and to a less extent posteriorly by the internal prostatic sphincter; also to the greater difficulty encountered in the local treatment of the deep urethra, since injections as commonly used do not reach this point, and, finally, we may add the disturbing influence which the sexual system exerts, with particular force, on this part of the urethra.

While a chronic inflammation of the anterior urethra is rarely found, except as the sequence of an acute attack, it is not so, however, in the deep urethra where a chronic inflammation is frequently found without the pre-existence of an acute inflammation. This may be readily accounted for if we keep in view the relationship of the deep ure-

thra to the sexual functions. During sexual excitement the caput gallinaginis becomes turgid from the overfilling of the lacunar spaces of the erectile tissue, which is found beneath the mucous membrane of this body, and swells to such an extent that it closes the urethral canal. It is this closure of the urethral canal which prevents the passage backward to the bladder of the seminal fluid during ejaculation, and renders it difficult or impossible to urinate while the penis is in a state of erection.

Causes, such as sexual excesses, masturbation, and to a still greater extent, ungratified sexual desires, which increase to an unnatural degree either the duration or frequency of the congestion of this portion of the urethra are prone to set up an inflammatory disturbance, which is usually at first of but slight intensity, but, after long continuance and repeated attacks, produces a low grade of chronic inflammation, which is manifested by a thickening and congestion of the mucous membrane and an hypertrophy of the caput gallinaginis. Patients who have a rheumatic, a lithæmic, or gouty diathesis are so often the subjects of chronic posterior urethritis that a causative relationship must be accorded to these diathetic conditions. With these factors at work, namely, in the order of their importance, gonorrhœal infection of the posterior urethra, disturbance of the sexual functions, and the rheumatic, lithæmic, and gouty diathesis, together with the difficulty encountered in the treatment of the diseases of the deep urethra, it is not to be wondered at that it is in this portion of the urethra, above all others, that we find chronic inflammatory lesions with the greatest frequency. This statement may not accord with those of other writers on the diseases of the urethra, but it is given, nevertheless, with a firm conviction of its accuracy,

based on a careful consideration of the subject, and on the result of repeated endoscopic examinations, partly undertaken with the view of determining this point.

Pathology.

The anatomical changes in posterior urethritis bear a close resemblance to the changes in anterior urethritis. It is said by numerous writers that granulations are never found in the posterior urethra, although Desormeaux, the father of urethral endoscopy, has described them in this situation. The mucous membrane may be thickened, very vascular, and thickly studded with papillary outgrowths, which contain minute blood-vessels, giving to the part the velvety appearance of the small intestine. In other cases the round-celled infiltration of the mucous and submucous tissues has gone on to the formation of connective tissue, producing a sclerosis and rigidity of the mucous membrane. The glands of the urethra are usually involved in the same process, which extends along and around the ducts into the substance of the prostate. The involvement of these glands may be quite extensive. In the early stages the process is usually, if mild, a desquamative catarrh; if acute, a desquamative purulent catarrh. The latter condition is the cause of prostatorrhœa. Associated with and part of this condition is an enlargement or swelling of the prostate, from involvement of its glandular structure. The prostate is tender and frequently studded with nodules, caused by blocking of the orifice of the glands and the consequent formation of minute retention cysts within its substance. In the advanced stage of the process the transformation of the periglandular infiltration into connective tissue produces,

first, compression and then destruction of the glands, while, *pari passu*, as a result of this destructive process, there is a progressive atrophy of the prostate. The most interesting changes, however, are to be found in the caput gallinaginis, which increases in size, sometimes to two or three times the normal. In addition to the thickening of its mucous membrane there is an hypertrophy of its underlying erectile tissue. The sinus pocularis and the ejaculatory ducts become involved in the inflammatory process, which, if it goes on to the formation of connective tissue, produces a rigidity and stenosis, or even occlusion of these ducts; it is doubtless the stenosis of the latter which produces the sharp pain often experienced, in cases of long standing posterior urethritis, at the moment of ejaculation.

CHAPTER XVI.

CHRONIC POSTERIOR URETHRITIS.

Symptoms and Treatment.

The symptoms of chronic posterior urethritis are dependent partly on the cause of the disease, and partly on the degree of involvement of the glandular structures which communicate with this portion of the urethra. When a chronic posterior urethritis is a sequence of the acute form of the disease, it is characterized either by a desire to urinate frequently, or more often by an increase in the intensity of the stimulus when once the desire has arisen. This is readily explained if we consider that when the bladder is filled a few drops of the urine leak into the posterior urethra, which, from its hyperæsthetic condition, consequent on its inflamed state, sets up an acute desire to urinate, which, if resisted, may become within a short time so strong as to be uncontrollable. If the posterior urethritis owes its origin to disturbances in the sexual functions, then urinary disturbances are less prominent. In these cases, as a result of the long-continued irritation of the exceedingly sensitive caput gallinaginis, which, as we have seen, has a complex nervous supply, reflex nervous phenomena assume a predominating influence in the symptomatology of the disease.

If there is marked involvement of the prostatic glands, there is a feeling of weight and fulness in the perineum,

and frequently with the expression of the last drop of urine, or during defecation, there is an expulsion of a whitish, glairy fluid, having a seminal odor, which is often a source of considerable alarm to the patient. This symptom, to which the name prostatorrhœa has been given, is caused by the squeezing of the prostate gland and the consequent emptying of its glandular secretion, by the compression of the levator ani and detrusor muscle of the bladder, or by the passage over the prostate of hardened fæces during defecation. Not infrequently the seminal vesicles are involved in the inflammatory process and a true spermatorrhœa may be present; in this case the secretion may be quite profuse and the patient's alarm all the greater.

As a consequence of the hyperæsthetic condition of the caput gallinaginis and the diseased condition of the ejaculatory ducts, pollutions are frequent; for the same reason sexual congress is unsatisfactory and emissions are premature. The patient soon concentrates his thoughts on his malady, which he magnifies to an unlimited extent. He becomes hypochondriacal, and is in a fit state to believe what any designing quack may tell him about lost manhood, premature decay, and the host of other evils so graphically portrayed in the current newspapers of the day. I admit that this is an extreme picture of this neurotic condition, but it is one, however, which is not overdrawn, and not infrequently met with.

The most common symptoms in mild cases with but little neurotic disturbance are, aside from the disturbance of the function of micturition, vague, ill-definable, but more or less constant uneasy sensations, or pains, over the pubes, inguinal region, glans penis, and inner surface of thighs; and shooting pains, or, as the patient will

sometimes express it, a feeling as of a hot iron being drawn along the urethra (neuralgia of the urethra).

Treatment.

For the successful treatment of this disease it is essential that we first of all secure the full confidence of the patient, and in no way can this be better or easier done than by an examination of the case that will be thorough enough to convince the patient that you understand your business. The patient will have already had sufficient experience of this sort to enable him to make a fair estimate of your ability from the manner in which you examine him, and will make mental comparisons that are anything but flattering if you are careless or indifferent. Having secured the confidence of the patient it is well to clinch what has already been acquired, by a rational explanation of the nature and symptoms of the disease. When the fears he has conjured up concerning his case are groundless, do not attempt to disperse them by ridicule. To the patient they are serious realities, only to be dissipated by a feeling of absolute confidence in your statements, backed up by your rational explanation of their groundlessness. When you have succeeded in securing both the patient's confidence and his perception of his symptoms at their proper value, the case is under favorable conditions for recovery, and you will have the co-operation of the patient during what may prove a tedious course of treatment. In many of these cases the treatment of a diseased imagination is often as important as the treatment of the diseased urethra, and unless the full confidence of the patient is obtained the best efforts will be met with but partial success.

We may, for this purpose of treatment, classify with ad-

vantage the cases of chronic posterior urethritis into two groups: those that are directly due to gonorrhœal infection of the posterior urethra, and those that are not of gonorrhœal origin. In the first group of cases the prominent symptom is a disturbance in the function of micturition. If, however, the case is of long standing, it may be indistinguishable, clinically speaking, from the second group in which neurotic symptoms predominate.

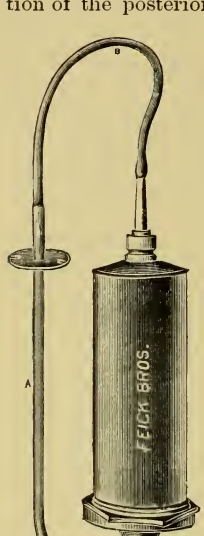


Fig. 40. — Ultzmann's Irrigating Catheter Syringe.

In the first group there is either a frequency in passing water, or an abnormally acute desire to urinate when once the desire has arisen. Associated with this there may be a feeling of fulness or dragging in the perineum. In these cases the treatment does not differ materially from the treatment of chronic anterior urethritis. The urine should be maintained, by the use of alkalies and diluents, in as unirritating a condition as possible. Every second, third, or fourth day a cold steel sound, the full size of the urethra, should be passed, and held *in situ* about one minute.

Injections of nitrate of silver solution, 1 to 4 grains to the ounce, should immediately follow the use of the sound. The injection should be deposited, by the deep urethral syringe, in the posterior urethra, a few drops only being used. Ultzmann recommends the use

of an irrigating catheter syringe (Fig. 40). The catheter is inserted into the posterior urethra, and the fluid slowly injected. If the bladder is capacious several syringefuls may be used, and the patient, at the conclusion of the treatment, requested to empty his bladder. It is obvious that only weak solutions must be used, otherwise the bladder would be irritated. The injections recommended in the treatment of acute anterior urethritis may be used for this purpose with perfect safety.

The treatment indicated above will rapidly cure an ordinary case of chronic posterior urethritis that has not as an accompaniment, or rather as a symptom, reflex neurotic or sexual disturbances, in which the prognosis is much less favorable.

In long-standing cases of posterior urethritis of gonorrhœal origin, or due to such causes as ungratified sexual desires, sexual excesses, or masturbation, the treatment, to be efficient, must be more drastic. In these cases structural changes are often very deeply situated not only in the prostate, but may also extend along the ejaculatory ducts to the seminal vesicles; prostatorrhœa, vesiculitis, pollutions, spermatorrhœa (true and false), are the complications we often have to deal with. To these may be added the morbid mental phenomena which these diseased conditions engender. It will readily be seen from this picture that the treatment of this variety of chronic posterior urethritis frequently offers difficulties that are well-nigh insurmountable.

The caput gallinaginis is usually hypertrophied, and, if we pass a sound, the moment it is touched the patient experiences an intense, sharp, sickening pain. For the relief of this condition pressure and cold are efficacious. A large steel sound dipped in ice-water should be

passed, at regular intervals, or the psychrophor (Fig. 41) may be used and a stream of ice-water passed through it for ten or fifteen minutes.

In conjunction with the above treatment cauterization of the caput gallinaginis is useful. It has been recommended on the highest authority to use the solid stick of nitrate of silver for this purpose. I have never had the courage to adopt such heroic treatment, and therefore hesitate to recommend it, although the desperate character of some of these cases would justify the adoption of almost any treatment, no matter how severe, that offers any hope of benefiting the patient. I do not hes-

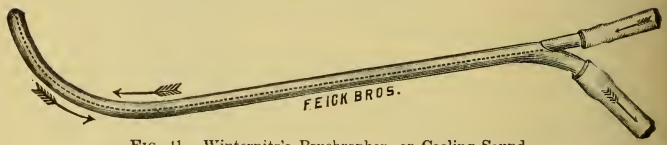


FIG. 41.—Winternitz's Psychrophor, or Cooling Sound.

itate, however, to use in the following manner a solution of silver of a strength of sixty grains to the ounce. The caput is first fully exposed by the endoscope, then its surface is freely swabbed with the solution. Even after this application a few drops of blood will often follow the act of urination, and the tenesmus for the first few hours is often very severe. It is needless to say that this application should not be repeated until the reaction following the previous application has subsided.

Seminal vesiculitis and spermatorrhœa (true and false), which so frequently complicate these long-standing cases of chronic posterior urethritis, are so far-reaching in their effects, and withal so important, that they deserve separate consideration, and for that reason will not be touched upon in the present chapter.

CHAPTER XVII.

COWPERITIS.

A RÉSUMÉ of the diseases of the urethra would be incomplete without a brief description of the most common complications that are met with as a result of the extension of the gonorrhœal process along the ducts that open into the urethra. The extension of the gonorrhœal process, and its perpetuation, in the glands of Littre and urethral lacunæ has already been dwelt upon in the chapters on the pathology and treatment of chronic urethritis, and will not enter into the present discussion, which will be confined to the inflammations of the glands of Cowper, the prostatic glands, the epididymis, and the seminal vesicles.

The Glands of Cowper.

These glands are often ignored by writers on urethral diseases, and when mentioned they are usually treated in such a manner as to lead one to form the erroneous impression that, except for the acute inflammations to which they are subject, they do not form a factor in the diseases of the urethra.

The anatomy of these glands, according to Quain, is as follows: "In the bulbous portion of the urethra, near its anterior end, are the two openings of the ducts of Cowper's glands. These small glandular bodies (Fig. 34)

are seated above the bulb, behind the membranous portion of the urethra, between the two layers of the subpubic fascia, the anterior layer supporting them against the urethra. The arteries of the bulb pass above, and the transverse fibres of the compressor urethræ beneath these glands. They are two small, firm, rounded masses, about the size of peas, and of a deep yellow color. They

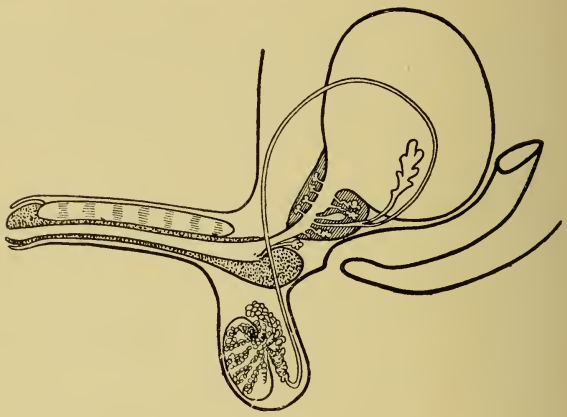


FIG. 42.—Diagrammatic Representation of Cowper's Glands, the Prostatic Glands, the Utricle, the Seminal Vesicles, and Epididymis.

are compound racemose glands, composed of several small lobules held together by a firm investment. This latter, as well as the walls of the ducts, contains muscular tissue. The epithelium of the acini consists of clear columnar cells, with a reticular protoplasm, staining like the cells of mucous glands. The ducts are lined with cubical epithelium. The ducts unite outside each gland to form a single excretory duct. These ducts run forward near each other for about an inch or an inch and a

half, first in the spongy substance and then beneath the mucous membrane, and terminate in the floor of the bulbous part of the urethra by two minute orifices opening obliquely."

Cowper's glands secrete a viscid fluid, which may serve the purpose of lubricating the urethra, but as they appear to diminish in size in old age, and as they are analogous to the glands of Bartholin in the female it is probable that their function is closely related to the sexual act. This hypothesis is supported by the anatomical situation of the glands. It will be seen that they lie (Fig. 42) between the bulb and the urethra, and are surrounded by the fibres of the ejaculator urinæ in such a manner that they would be compressed in the act of ejaculation; besides, the lobules and ducts are endowed with muscular tissue, from which we may infer that the glands may have ejaculatory properties of their own.

Acute inflammation of Cowper's glands is almost invariably due to an extension of a gonorrhœa from the urethra along the ducts of the gland, it therefore does not occur until the gonorrhœa has invaded the bulbous portion of the urethra, or usually not until two weeks after the inception of the disease. It may, of course, appear at any period subsequent to this, and in exceptional cases earlier, if the gonorrhœa has been unusually rapid in its progress along the urethra.

With the onset of the disease there is usually felt a deep, stinging, or boring pain in the perineum, and on examination a slight swelling, which is painful on pressure, can be detected to the left or right of the median line. The inflammatory phenomena often never go beyond this point, and frequently the disease is so mild that it is overlooked, and its symptoms, if recognized, attributed

to other causes, such as a posterior urethritis. In other cases, however, the long, narrow duct of the gland becomes occluded, and there is retention of the inflammatory secretion, which gives rise to the formation of an abscess, which gives the characteristic combination of symptoms of swelling, redness of the skin, fluctuation, and constitutional disturbance, to which may be added the obstructive symptoms resulting from pressure against the urethra, which may amount to total retention of the urine.

If the abscess is allowed to pursue its own course, it opens at the point of least resistance, which is usually through the skin, or it may open into the urethra, and in rare cases it may follow the planes of fascia and open either anteriorly or posteriorly, infiltrating the scrotal, or perirectal tissues, as the case may be.

The treatment is directed to the symptoms. If they are mild no special treatment is required and the disease is best left to pursue its own course. If the patient is annoyed by the pain he experiences he should be placed in the recumbent position, where this is practicable, and hot applications or leeches applied to the part. If pus is present, or even if there is a doubt about the matter, a small, narrow-bladed knife should be thrust into the most superficial part of the swelling, and if pus escapes it should be freely evacuated; if pus is not discovered the puncture will usually relieve the pain and often abort the inflammation.

It is the opinion of the writer that the majority of the inflammations of Cowper's glands are, from the mildness of their symptoms, undetected, and that many of them lapse into a chronic inflammation that gives rise to a most intractable urethral discharge. It will be fre-

quently noticed, on examining a case of chronic urethritis, that the moment the distal extremity of the endoscope is withdrawn from the membranous into the bulbous urethra, and has exposed that part, in which lie the orifices of the ducts of Cowper's glands, a drop of pus will suddenly appear in the endoscopic field. This has happened so often to the writer when examining this situation that he is forced to the conviction that there is a direct relationship between the pus and the glands of Cowper. It may be contended that the pus observed may be merely the urethral secretion that has accumulated in the bulbous urethra, but the same phenomena will appear if the patient has just urinated and cleansed his urethra of all secretion, and in exceptional cases will appear when the urethra, as far as an endoscopic examination can determine, is in a healthy condition.

While considering this subject we may digress far enough to inquire if the discharge from a chronic Cowperitis may not in exceptional instances be mistaken for a prostatorrhœa. When we consider that the glands in health secrete a viscid secretion which is poured into the urethra during ejaculation, or when squeezed by the compressor urethra in the act of expelling the last drops of urine, we may readily conceive if there is a hypersecretion of this fluid that it may be mistaken for a prostatic discharge. The writer has seen such a case where the patient was supposed to have, and had the symptoms of, a prostatorrhœa; but an examination revealed an apparently healthy prostate and an escape from the ducts of Cowper's glands of a profuse semipurulent viscid secretion.

The treatment of a chronic Cowperitis without an appreciable swelling, and without pain or tenderness, is,

unfortunately, on account of its situation, almost beyond our reach. Some writers on urethral endoscopy claim to be able to make applications within the openings of the urethral lacunæ and the ducts of Cowper's glands; to such the local treatment of the glands may prove efficacious, but the writer has never been able to attain the necessary degree of skill in endoscopy to accomplish this, nor has he ever been fortunate enough to see it done, and is therefore forced to rely on less modern methods of treatment, such as the dilatation of the urethra with steel sounds and local applications of nitrate of silver to the urethra in the neighborhood of the orifices of the glands.

In conclusion, it should not be forgotten that the existence of a chronic Cowperitis may sometimes explain the obstinacy of a chronic urethral discharge.

CHAPTER XVIII.

THE ANATOMY OF THE EPIDIDYMIS AND SEMINAL VESICLES.

The epididymis, from its peculiar formation, suffers most severely from the invasion of the gonorrhœal inflammation. It consists of a convoluted tube about twenty feet in length, which is coiled up in the most complicated flexuosities (Fig. 43). The canal of the tube which forms the epididymis varies in size from one-ninetieth to one-seventieth of an inch, but near its junction with the vas deferens it becomes considerably larger. It is lined with columnar ciliated epithelium which tends to propel the secretions toward the vas deferens. The epididymis is attached to the posterior part of the testicle, and at its upper portion, where its tubular prolongations become continuous with the testicle, it is considerably enlarged, forming what is called the globus major or head of the epididymis. The epididymis then descends, and at the lower part of the testicle it abruptly turns upward to become continuous with the vas deferens. The lower part of the epididymis is slightly enlarged and is called the globus minor or tail, the intervening por-



Fig. 43.—Plan of a Vertical Section of the Testicle, showing the Arrangement of the Ducts. (Quain.)

tion between the head and tail is called the body of the epididymis.

The vas deferens is the continuation of the canal of the epididymis. It passes upward to reach the inguinal canal, through which channel it enters the abdominal cavity, keeping under the peritoneum it reaches the base of the bladder and terminates, by its junction with the seminal vesicle in the common seminal or ejaculatory duct. The vas deferens is about two feet in length and has a diameter of about one-tenth of an inch, but becomes slightly enlarged at the base of the bladder, where it resembles the seminal vesicle, and then becomes narrowed before it joins its accompanying seminal vesicle. The epithelium of the vas deferens is of the columnar kind, but, unlike the epithelium of the canal of the epididymis, it is devoid of cilia.

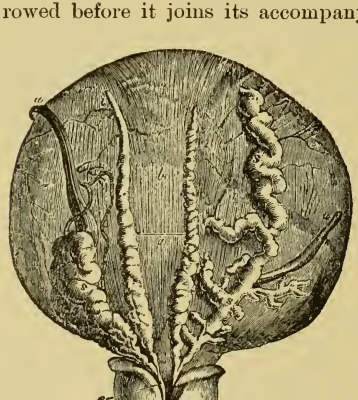


FIG. 44.—Base of the Male Bladder with the Vesiculæ Seminalæ, Vas deferentia, and Prostate Gland Exposed. (From Haller.)

The seminal vesicles (Fig. 44) are two membranous receptacles situated between the base of the bladder and the rectum, and lying external to the vas deferens. Each vesicle consists of a tube about two inches in length and half an inch in width at its widest part. When this tube

is unravelled, however, it is seen to consist of an irregular tube about six inches in length, which has been reduced to two by its numerous flexures and coils.

At its junction with the vas deferens it becomes straight and narrow, and joins with the latter at an acute angle.

The united vas deferens and seminal vesicle forms the ejaculatory duct, which passes forward between the middle and lateral lobes of the prostate gland, to terminate on the floor of the prostatic urethra in a minute opening, on the lateral portion of the anterior aspect of the caput gallinaginis.

The seminal vesicles serve as a pouch for the reception of the seminal fluid, and there are good reasons for believing that it is in the seminal vesicles that the spermatozoa mature; it has been noticed after frequent intercourse, that the spermatozoa are not completely formed, probably on account of their remaining but for a brief time in the vesicles. The seminal vesicle has also a secretion of its own, which is ejaculated with the seminal fluid, and seems essential to the virility of the latter. It is endowed with muscular tissue which enables it, under the stimulus of the sexual orgasm, to suddenly and forcibly evacuate its contents.

CHAPTER XIX.

EPIDIDYMITIS.

Inflammation of the epididymis is, in nearly every case, secondary to the gonorrhœal process in the deep urethra, and is supposed to be due to the transference of the infective secretion from the posterior urethra, along the ejaculatory duct and vas deferens to the convoluted tube which forms the epididymis. The metastatic theory of infection is scarcely tenable, but it is not always easy to explain on other grounds the rapid infection of the epididymis which we sometimes witness as the result of some exciting cause in the progress of a gonorrhœa, such as the passage of a sound, the use of injections, exercise on a bicycle or on horseback, or sitting on a stone seat, any of which may be followed by the onset of epididymitis which usually manifests itself within a few hours, or, at most, on the following morning. The rapid onset of the inflammation in these cases can scarcely be attributed to the extension of the inflammatory process along the entire length of the vas deferens, when we consider the vas deferens is about two feet in length, and that it takes the same process fully one week to travel from the meatus to the posterior urethra. It may be possible, but it is highly improbable, that the micro-organisms of the disease have in these cases already extended to the epididymis, and only await a

favorable exciting cause, such as has been mentioned, to become aggressive. It must be admitted that these explanations are unscientific, but they are the best we can offer, and in the absence of a more satisfactory solution of the question it must be left in this unsettled condition. It may be asked: Is an epididymitis always the result of a gonorrhœa? May it not appear independently of a gonorrhœa? May its presence not infrequently be a coincidence rather than a sequel of a gonorrhœa? An affirmative answer to these questions cannot be denied, but such an occurrence must be so exceptional that we need not consider the claim of a gonorrhœal parentage invalidated by it, and we are therefore justified in classifying an epididymitis among its numerous unhealthy progeny. Even in those rare cases where an epididymitis exists without any visible evidence of the existence of a urethritis, it should not be forgotten that a mild posterior urethritis may be present without any evidence of a urethral discharge other than is manifested by a careful examination of the urine.

It was formerly supposed that the left epididymis was affected more frequently than the right, but statistics show that the difference is so slight that it may be ignored. It is rare for the epididymis on both sides to be affected at the same time, and when such does occur there are grave dangers of impotence following from occlusion of both of the vas deferens.

The onset of an epididymitis is exceedingly rare before the termination of the first week of a gonorrhœa, and the majority of the cases occur between the second and fifth week of the disease. The following statistics from the cases collected by Fournier, Le Fort, Gaussaille, De Espine, Aubrey, Castelnau, and Unterberger (quoted from

Finger), give the results regarding the period of onset of epididymitis :

1 week after infection in				.....	46 cases.
2 weeks after infection in				.....	157 "
3 "	"	"	"	.....	132 "
4 "	"	"	"	.....	191 "
5 "	"	"	"	.....	132 "
6 "	"	"	"	.....	64 "
7 "	"	"	"	.....	44 "
8 "	"	"	"	.....	61 "
3 months after infection in				.....	66 "
4 "	"	"	"	.....	33 "
5 "	"	"	"	.....	18 "
6 "	"	"	"	.....	22 "
7 "	"	"	"	.....	9 "
8 "	"	"	"	.....	8 "
9 "	"	"	"	.....	5 "
10 to 12 years after infection in				.....	8 "
2	"	"	"	.....	9 "
3	"	"	"	.....	7 "
4	"	"	"	.....	2 "
7	"	"	"	.....	1 case.
					1,015 cases.

Symptoms.—The symptoms of epididymitis vary according to the severity of the inflammation, and we may recognize, if we wish, the subacute, the acute, and the hyperacute, but this distinction is artificial and for our purpose unnecessary. The milder forms of the disease may be associated with but little else than an aching and slight swelling of the epididymis, which is often localized to the head of the organ. In these cases there is an absence of constitutional symptoms, and the patient is usually able to pursue his ordinary occupation. These cases of mild or sub-acute epididymis are more often seen in the recurring type of the disease than in the primary attack which follows acute gonorrhœa, in which the onset of the disease is usually associated with severe constitutional

disturbance which is often so severe as to prostrate the patient. In severe cases the epididymis becomes quite hard and swollen, the enlargement is as a rule first noticed in the head of the epididymis, then extends to the tail, after which the vas deferens may become thickened and tender, this progression is contrary to what we would expect when we consider the course which the disease is supposed to travel, but it may be due to the fact that the convolutions of the tube are more numerous in the head of the epididymis than elsewhere, and therefore an inflammatory swelling is sooner manifested at this place. The epididymis sometimes become swollen to an enormous size when we consider its insignificance in health, and when the testicle becomes involved the swelling of both may form a tumor as large as the fist. In severe cases the overlying scrotal tissues become inflamed and œdematous, and the tunica vaginalis may be distended with fluid (acute hydrocele). There is a type of this disease, fortunately rarely met with, in which the symptoms are alarming, and in some cases, especially if the patient has been debilitated by previous illness, may seriously endanger the patient's life, even fatal results have ensued. In these cases the disease is ushered in with a severe chill. The temperature may run up from 103° F. to 105° F., and the pulse range from 100 to 150. Vomiting may be severe and persistent, and the symptoms of strangulation of the intestine may be closely simulated; the simile may be almost complete if we find the inguinal canal occupied by a very much swollen and a very tender vas deferens. The operation for strangulated hernia has been undertaken for such a case as has just been described.

There is a troublesome variety of epididymitis which may be called the recurring variety. In these cases the

inflammation is seldom severe, if we leave out of consideration the primary attack, but there is a tendency, as the name indicates, for the disease to return on the slightest provocation. Some of these patients are almost invalided by the disease, as they are scarcely free from one attack before the onset of another. Even when there is no visible discharge from the urethra, and when the patient considers himself free from urethral inflammation he may be pestered by the recurring epididymitis. It will usually be found, however, that the freedom from urethral disease is more fancied than real, for an examination of the urine will usually show the presence of pus and epithelial threads, and the passage of the sound will often reveal an abnormal tenderness of the posterior urethra; nor will these attacks in all probability cease until the posterior urethra has been restored to a healthy condition.

In some cases of acute epididymitis, more especially if the testicle is also involved, the inflammation terminates in the formation of an abscess which either ruptures externally or is opened by the surgeon. From these abscesses a curdy pus is evacuated, in which broken-down tubules and glandular tissue is found. These abscesses are prone to leave persistent indurated sinuses which continue for a long time to discharge a little curdy pus.

One of the most unfortunate sequelæ of epididymitis is atrophy of the testicle from blocking of the duct of exit. This is usually found in the vas deferens near the epididymis, and may follow from a slight degree of inflammation, but the liability to its occurrence is proportional to the severity of the inflammation. As in most double organs the function may continue when one organ is destroyed, so also in the testicles, if one of them is de-

stroyed impotence is not produced. In cases of double epididymitis, however, a guarded prognosis should be given regarding the further usefulness of these organs.

A peculiar symptom, which has not been satisfactorily explained, and which has been used to bolster up the theory of the metastatic cause of epididymitis, is the marked decrease in the urethral suppuration which follows the onset of an epididymitis. This symptom is often most pronounced: for example, in the evening the urethra may be discharging most profusely, and in the morning it may have disappeared, but is replaced by that peculiar sickening pain, so characteristic of epididymitis, which makes the patient feel that in escaping from his urethritis he has fallen out of the frying-pan into the fire. It seems useless to attempt to explain this phenomena, as one theory can be met with a counter-theory equally as good, and we may add equally as unsatisfactory, so we are forced to content ourselves with the recognition of the clinical fact and to leave this enigma for the present unsolved. It should be noted that with the subsidence of the epididymitis there is usually an increase in the urethral discharge.

Treatment.—The treatment of epididymitis, while all-important, will be dwelt upon but briefly. The heroic methods of treatment, which have been recommended, such as the application of the actual cautery to the inflamed part, and puncture of the tunica albuginea, had perhaps better be reserved for hospital cases, as but few patients will be found willing to submit to such treatment, and we should resort, preferably, to the more lenient but time-honored remedies. In the acute stage of the disease there is nothing better than heat or cold, the former being applied by means of a poultice, which should

be large enough to surround the entire scrotum, and warm enough to make the patient flinch when first applied. It has been the custom, and it seems to be a good one, to strew the surface that is applied to the scrotum with a thin layer of common cut tobacco, and to continue this application until the patient is slightly nauseated. It is hard to imagine that this point will be easily reached in those accustomed to the use of tobacco, in whom it is probably less efficacious than in those who are not tobacco habitues.

Cold applications are, as a rule, less efficacious and less agreeable to the patient than hot, and many cases will not tolerate them. In other cases it is the remedy *par excellence*, but unfortunately I know of no criterion by which we may judge of the cases for which it is best adapted. If cold is applied it should be in the form of the ordinary lead-water and opium solution. Cracked ice is difficult to apply, and the intensity of the cold is, to say the least, painful.

In the acute stage of the disease it is all-important that the patient be kept in the recumbent position. This is much more important than internal medication, which is usually disappointing and in most cases may well be ignored, unless it should be necessary to regulate the bowels or relieve pain, if the latter is intense.

After the acute stage has passed nothing is so comforting and hastens resolution so quickly as uniform pressure, but unfortunately the testicles are so movable that this is not easy to apply. A good tight-fitting suspensory, such as the Army and Navy bandage, is about the easiest to apply, but it does not as a rule reduce the swelling so quickly as strapping the testicle, which has the added advantage of the retention of the heat and moist-

ure of the part by the use of the impervious adhesive plaster. The proper application of the adhesive strapping to the testicle is an art which can only be acquired by experience. Full directions for this can readily be obtained from almost any of the works on surgery, and it therefore need not be entered into here, but the novice should be warned, in order to avoid disappointment, that his completed work will probably bear but little resemblance to the cuts one sees of it, for the original of some of the graceful cuts of strapped testicles must have existed solely in the mind of the artist who made them.

It is necessary to renew the strapping whenever the testicle shrinks so much that the strapping becomes loose.

In some cases of epididymitis an indurated painful nodule will remain in some part of the epididymis to torment both patient and physician. These painful indurations are most obstinate to treatment, but in time will wear away. Iodine, either internally in the form of iodide of potassium, or iodine ointment applied over the induration, seems most efficacious in these cases. If this treatment fails, massage may be tried if the induration is not too painful.

In those unfortunate cases where atrophy of the testicles follows as the result of destruction of the lumen of the vas deferens, there is but little treatment to be adopted further than the cultivation of a spirit of resignation. We may, however, in selected cases, excise the obliterated portion of the vas deferens and suture the severed ends together. This has been successfully accomplished and may offer a ray of hope in an otherwise hopeless case.

After the recovery from an attack of epididymitis the

patient should continue to wear a suspensory bandage for at least a month, and longer, if, in the meantime, his urethritis has not recovered.

Perhaps the most important treatment in relation to this subject is the prophylactic treatment. To prevent the disease is infinitely better than to cure it, and much may be done in this line by the wearing of a suspensory bandage during the course of a urethritis, by the discriminating use of injections, in fact by any precaution or treatment that will tend to prevent the extension to the posterior urethra of the gonorrhœal process.

CHAPTER XX.

ACUTE SEMINAL VESICULITIS.

Acute seminal vesiculitis is, almost without exception, like acute epididymitis, a result of the extension of the gonorrhœal process to the deep urethra, from which it extends, along the ejaculatory duct, to the seminal vesicle. Many of the symptoms of this affection correspond very closely with some of the symptoms of acute posterior urethritis, and on this account it is probable that its presence is often overlooked, especially as a positive diagnosis can only be made by a rectal examination. We know the frequency with which the gonorrhœal inflammation extends to the epididymis; and in doing so, if we accept the theory of infection by extension of the gonorrhœa along the ejaculatory ducts and vas deferens, there seems to be no good anatomical reason why it should not extend with equal facility to the seminal vesicles. A more careful observation on this point will probably demonstrate that acute seminal vesiculitis is at least as frequent as acute epididymitis.

Acute seminal vesiculitis is often masked by its association with acute posterior urethritis, but if we will, for our purpose, isolate these affections, it will be found that acute vesiculitis is characterized by a burning, tense feeling, felt deep in the perineum; along with this there will be an irritable condition of the bladder, frequent and painful micturition, and a disagreeable sensation in the rec-

tum, which is aggravated by the accumulation of fæces or by the movement of the bowels.

The sexual organs are usually in an easily excited condition; pollutions are frequent and painful; the ejaculated fluid is usually very abundant, and in some cases may be bloody, but more often is yellowish from the presence of pus, and leaves a stain on the linen.

There may be severe constitutional symptoms, particularly if there is an obstruction of the excretory duct and retention within the vesicle of the inflammatory products.

A rectal examination reveals a hot, tender, and swollen vesicle, and the prostate gland will often be found in a similar condition. When both vesicles are involved they may apparently coalesce in the median line and form a swelling of considerable dimensions.

This disease usually ends in resolution in from one to two weeks, but in a small percentage of the cases the disease assumes a chronic form, and in rare cases an abscess forms from the obstruction of the duct of exit. The treatment varies but little from that of acute prostatitis, and consists in the maintenance of the recumbent position, and also in the use of hot-water injections into the rectum, or by the local application of cold, which is accomplished by the insertion of a piece of ice just within the grasp of the sphincter ani. The bowels should be regulated, and the accumulation of fæces within the rectum avoided. When suppuration of the vesicle takes place the pus should be evacuated as soon as possible, for if left to itself it may rupture in an unfavorable situation and may infiltrate the subperitoneal tissues, or even empty itself into the general peritoneal cavity. It is advisable to evacuate the pus through an

incision carried transversely between the bulb of the urethra and the anus, the dissection should be carried parallel to the rectum, a finger being kept within the latter to act as a guide and to prevent the wounding of the rectum. In some cases the abscess may be advantageously evacuated by an aspirator inserted through the wall of the rectum, and the cavity, as soon as the pus is evacuated, washed out, by means of the same instrument, with an antiseptic solution.

CHAPTER XXI.

CHRONIC VESICULITIS AND FOLLICULAR PROSTATITIS.

This is a complex subject to deal with because it involves the consideration not only of the phenomena directly dependent on the pathological condition of the vesicles and prostatic glands, but also, to a perhaps still greater degree, the consideration of the peculiar mental phenomena engendered by this condition, to which the name genito-urinary neurosis has been given. Nor can this subject be intelligently discussed separately or without taking into consideration the morbid conditions that are usually present at the same time in the adjacent structures, namely, the utricle and caput gallinaginis, as well as in the mucous membrane of the posterior urethra, the whole being endowed with a very sensitive and very highly organized nervous supply (page 120), which renders it peculiarly susceptible to the impressions its morbid condition engenders, and which, in its turn, by acting on the general nervous system, produces that neurotic and neurasthenic condition these cases so frequently exhibit.

We have long known the baneful effects on the nervous system of women produced by chronic inflammation of the uterine mucous membrane, and we have also seen (page 118) the analogy of the uterus and the parts under discussion not only in development but also in nervous

supply, therefore it is not difficult to appreciate the reason for the almost hysterical manifestations that some of these cases of catarrhal affections of the deep urethra and its diverticula present.

It is unnecessary to enter into a dissertation on the peculiar neuropathic conditions which we find to hold a prominent place in the symptomatology of this disease, as such is best reserved for works on nervous diseases; suffice it for our purpose to recognize the existence of such conditions and their frequent dependence on the presence of some long-standing morbid condition of highly organized structures such as are at present under consideration.

It will be necessary, however, before entering into the subject before us, to define one of the most prominent symptoms we will meet with, namely, spermatorrhœa. Spermatorrhœa is divided into the true and false. True spermatorrhœa consists in the loss of seminal fluid at abnormal times; that is, at times when sexual excitement is absent or not sufficiently intense to produce an orgasm. False spermatorrhœa is the loss of fluid resembling semen, which usually escapes from the urethra after defecation and sometimes after urination. It should not be forgotten, however, that these two affections may coexist, and in false spermatorrhœa a few spermatozoa may be present in the discharge.

It will also be understood that unless special reference is made, the glands of the prostate and the seminal vesicles are considered together.

Chronic inflammation of the seminal vesicles and prostatic glands is produced by the same causes to which chronic posterior urethritis owes its origin. Unquestionably one of the most potent factors is the extension of

the gonorrhœal process, which may at first produce acute prostatic folliculitis and acute seminal vesiculitis; but there are undoubtedly many of these cases that should be classed among the subacute or chronic from their beginning, just as there are cases of gonorrhœal posterior urethritis that are so mild in their inception that they should be excluded from the acute form of the disease.

Disturbances in the sexual functions, notably masturbation and ungratified sexual desires, play a no less potential part in the production of chronic vesiculitis and follicular prostatitis. To these may be added excessive sexual indulgence, and in all probability sedentary habits, the rheumatic or lithæmic diathesis, if not exciting causes, at least predispose to its production.

The pathology of the disease is simply that of catarrhal inflammation of the lining membrane of the prostatic glands and seminal vesicle, with the development in long-standing cases of periglandular connective tissue and consequent fibroid changes. The prostate in the early stage is swollen and tender, and its surface is nodular from the formation of minute retention cysts as the result of the blocking of the orifice of the glands. Later there may be atrophy of the prostate from the development and contraction of the periglandular tissue, which in time may obliterate the glands and by this process effect a cure of the local inflammatory trouble. The seminal vesicle will also be found to be swollen and thickened from the development of fibroid tissue.

The symptoms are somewhat complex when we take into consideration the neurotic phenomena almost always associated with this disease. The patients are liable to be depressed at trifles, there is often a want of energy and a degree of lassitude that cannot be accounted for

by any defect in the patients' general health, for, as a rule, these patients look to be in fairly good condition, although they often suffer from dyspepsia and lithæmia. Many of these patients are hypochondriacal to an extreme degree, and seem to take a delight in magnifying their ailments, and will innocently ask their physician if there ever was a case as bad as theirs.

In some cases neurasthenic symptoms predominate and the patients will make their bodily and mental fatigue the burden of their complaints. In others there is a lack of fixation of the will-power, they will take up some task with their usual energy, but in a short time it palls upon them and it is with difficulty that they can fix their attention on the work before them. A lack of memory is also often met with. It will readily be seen that these patients form good picking for the vultures that hang on the outskirts of our profession and gain an infamous livelihood by preying on the fears of their patients. Let one of them pick up a newspaper and read the glaring advertisements about lost manhood, insanity, etc., and unless he is more sensible than the average of these cases he is likely to be anything but benefited by the perusal of such literature.

The symptoms which distress these patients the most refer to the sexual functions. Early in the disease the sexual organs are abnormally excitable and pollutions are frequent. Sexual congress is usually unsatisfactory, owing to a premature emission as a result of the hyperæsthetic condition of the posterior urethra, especially of the caput gallinaginis. There is usually but little sensation in the act, although sometimes a sharp pain is experienced at the moment of ejaculation if the vesicles are very tender, or, if there is a stenosis of the

ejaculatory ducts, which may be caused by a swelling of the mucous membrane or a narrowing from the encroachment of the surrounding interstitial tissue. In other cases there is a more or less degree of impotence, produced either by a lack of sexual desire or an inability to produce an erection, and the patients will often complain that the penis is cold and shrivelled up. In some cases there is an escape of glairy fluid which has a seminal odor, and in which the microscope demonstrates the presence of numerous spermatozoa; this fluid may escape under the stimulus of sexual excitement or even without such stimulus, and the patient will be conscious of it trickling from the meatus. Sometimes it only appears after straining at stool or after urination. In other cases, and these are the most common, the fluid resembles semen in appearance and odor, but contains few or no spermatozoa, which, when present, are usually lifeless. This fluid is expressed from the seminal vesicles or the prostatic glands, or both together; it is thinner than normal semen, and is less readily coagulable.

It is rarely seen except during defecation or after the act of urination, being extruded by the contraction of the levator ani and detrusor muscles of the bladder.

As the seminal vesicle is normally a receptacle for its own secretion, and probably that of the testicle also, we must presume that when its contents escape at abnormal times there is either an excessive secretion or a patulous condition of its excretory duct. It is probable that in vesiculitis both these conditions exist at the same time.

Ultzmann lays considerable stress on the diagnostic value of the presence of spermatic crystals in determining the source of these discharges. These crystals are colorless, transparent, rhomboid bodies (Fig. 45), and

the method of examining for them is as follows: The suspected fluid is placed on a glass slide and permitted to dry in the open air, and then examined at intervals. If the fluid is exclusively from the prostatic glands no spermatic crystals will appear. If it is normal semen the crystals will not only be scant, but will also be late in making their appearance, perhaps not for one or two days. On the other hand, if the fluid is vesicular, and such as we see in vesiculitis, the crystals will appear early, probably in half an hour, and as time goes on they will be found in great abundance. These crystals belong essentially to the secretion of the seminal vesicles and are therefore of considerable diagnostic importance.



FIG. 45.—Spermatic Crystals. 300 Diameters. (Ultzmann.)

The treatment of these cases, as may be readily conjectured, is a matter of difficulty and uncertainty, and a guarded prognosis should always be given, for it not infrequently happens that the case, in spite of all treatment, remains unchanged, although in most cases a marked improvement or a cure can be effected.

It is important that the neurotic symptoms should be combated, and the groundless fears which the patient usually entertains dispelled. All irregular habits that may be productive of this disease should be corrected.

If there is dyspepsia or lithæmia present they should be attended to, and the patient's general health brought to the best possible condition. A sea-voyage, or an entire rest from active duties, will often be productive of markedly beneficial results. Aside from the general treatment internal medication directed to the diseased parts will often be beneficial, but should be used with discrimination. If there is a very excitable condition of the sexual organs, bromide of potassium seems to be the most efficacious, and lupulin, camphor, and hyoscyamus are sometimes useful. In the advanced atonic stage, associated with diminished sexual excitability, strychnia, iron, and phosphide of zinc may be tried.

Locally, electricity has been employed with benefit, but it should be used very cautiously, and only weak currents employed at first. The galvanic current may be used by applying a urethral electrode, attached to the negative pole, to the deep urethra; the positive electrode being applied to the perineum. The faradic current may be employed by applying the anode over the perineum and the cathode within the rectum.

The most efficacious treatment seems to be the introduction of large, cold sounds within the deep urethra, and maintaining them *in situ* for about five minutes. This treatment should be repeated about every second or third day. Winternitz's cooling sound (Fig. 41) is also a very useful agent in the treatment of this disease.

If there is at the same time a catarrhal condition of the posterior urethra present, it should be treated according to the method recommended in Chapter XVI.; in fact, the treatment recommended for posterior urethritis resembles, or is almost identical with, the treatment recommended above. Fuller, of New York, has

written a work on seminal vesiculitis, in which he claims to have obtained good results from stripping or milking the seminal vesicles. The method he adopts is to have the patient bend forward so that his body and legs are at right angles, and with the finger express the contents of the seminal vesicles by a stripping motion. This treatment may possibly be efficacious, but it is a little difficult to understand its therapeutic action, and it would seem to be a difficult matter to reach with the finger the distal extremity of the vesicle.

CHAPTER XXII.

STRICTURE OF THE URETHRA.

Anatomy.

THE urethra in a state of quiescence is a closed canal, its mucous surface being retained in apposition by the elasticity and contractility of the connective and mus-

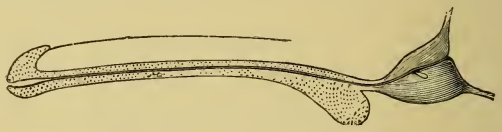


FIG. 46.—Diagram of the Closed Urethra.

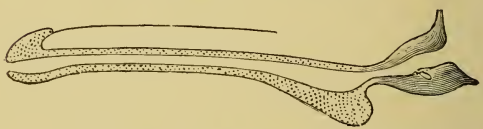


FIG. 47.—Diagram of the Moderately Distended Urethra.

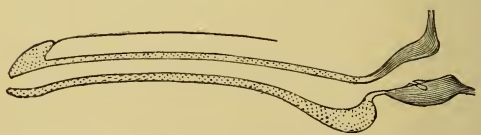


FIG. 48.—Diagram of the Forcibly Distended Urethra.

cular tissues which invest it throughout its whole extent. It is only therefore when it is dilated, as during urination or instrumental interference, that a stricture is capa-

ble of demonstration. When the urethral canal is closed or at rest its lumen may be represented by a capillary tube which conforms to the curves of the urethra, as in Fig. 46. It is self-evident that the lumen of the urethra, if a lumen can be said to exist under such circumstances, is uniform throughout, with the possible exception of the portion comprising the fossa navicularis where the urethral walls are seldom accurately coaptated. When the urethral walls are separated by intra-urethral distention, the urethra, as it were, unfolds itself and exerts a distending force on the peri-urethral tissues. Up to a limited degree of dilatation the urethra maintains a uniformity in its calibre, but as the dilatation increases the variability in certain portions of the urethra, not only of its own elasticity, but also of the resistance to displacement of the peri-urethral tissues, produces a variation in its calibre which, at first scarcely recognizable, becomes, on further distention, very marked, as is shown in Fig. 47, and to a still greater extent in Fig. 48, where the distention is very great. A few years ago I devised a urethrograph (Fig. 49) for taking a diagram of the dimensions of the urethra. This instrument is so constructed that it will take a diagram of the dimensions of the

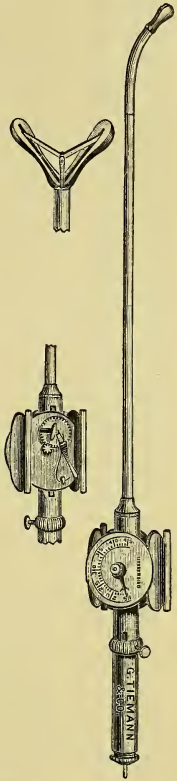


Fig. 49.—The Urethrograph.

whole urethra, under a uniform but adjustable degree of distention. The observations which I have made with the urethrograph have not shed a new light on the topography of the urethra, but have simply served to confirm the observations that anatomists have long since made, namely, that the distended urethra is a canal of variable diameter, no one part of which can be taken as a criterion of the dimensions of the other. Nor can one urethra be taken as the standard from which to judge others, so much do they differ from each other in their relative dimensions. Not only does the lumen of one urethra differ from that of another, but each urethra differs from itself according to the degree of distention it undergoes. This is well illustrated in the following series of diagrams (Fig. 50), taken with the urethrograph from the same urethra under varying degrees of distention. The lines traced by the urethrograph do not represent the contour of the urethra; they only show the diameter of the urethra, at all points, in millimetres, measured from a straight base line. The first diagram, or the one nearest the base line, shows the urethra under a moderate degree of distention. The second, third, and fourth diagrams show the urethra under a progressively increased degree of distention. It will be noticed that the greater the degree of distention the greater the deviation from uniformity of calibre; and conversely, the less the degree of distention the more nearly uniform becomes the calibre



FIG. 50.—Urethrographic Tracings.

of the urethra. As the distending force exerted against the urethra by the urethrograph was certainly greater in the diagram nearest the base line than would be exerted by the passage of a stream of urine, the inference is fair that the urethra under a degree of pressure equivalent to that exerted by the passage of a stream of urine would conform more closely to a tube of uniform calibre. The chief points of interest which these diagrams bear to the subject of stricture are that the healthy urethra, as distended by the passage of a stream of urine, is a canal of almost uniform dimensions, and that the same urethra under a degree of distention no greater than is habitually exerted by the passage of urethral instruments shows marked irregularities in its calibre. The calibre of the urethra is thus a fluctuating quantity, its variations depending on its degree of dilatation; therefore no standard can be given as accurately representative of the normal urethra.

Sir E. Home has given a cast of the normal urethra under forced dilatation which may be considered a fair representative of the over-dilated urethra (Fig. 51).

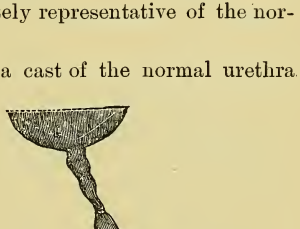


Fig. 51.—Diagram of the Urethra Showing its Extensibility. (Sir E. Home.)

In a memorable controversy between Dr. Sands and Dr. Otis on this subject, the former exhibited a series of casts of the urethra (Fig. 52) to illustrate its natural irregularities. Dr. Sands contended that these irregularities were present in the healthy urethra, and were in no-

wise pathological. To this Dr. Otis replied that these irregularities were either of pathological formation, or, if not, would, by retarding the stream of urine, and thus

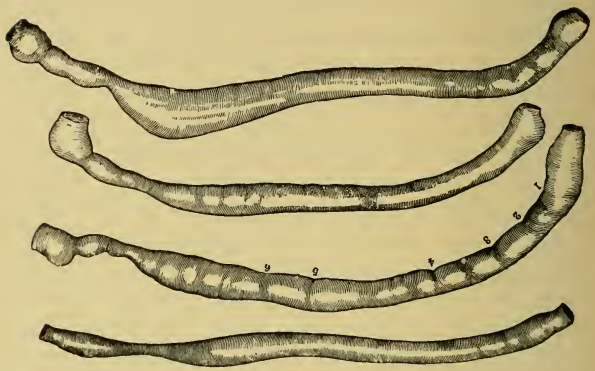


FIG. 52.—Casts of the Male Urethra. (Sands.)

creating a point of increased friction, be capable of perpetuating a urethral discharge. Since no evidence could be brought forward to prove the absence of a pre-existing urethritis in the cases from which these casts were taken, the arguments put forward that the irregularities were pathological in formation could not be refuted, although the weight of evidence was against such being the case. In considering this subject it occurred to the writer that a series of casts of the infantile urethra would be representative of the urethra under conditions which would preclude the possibility of pathological irregularities in its formation. The opportunity was therefore availed of to make a series of wax casts of the infantile urethra, cuts of which are given in Fig. 53. The first cast was taken from the urethra of an infant two weeks

old. The injection was made under water; the wax was forced into the bladder until a stream issued from the meatus which was estimated to be equivalent in force to that of a stream of urine. In a few moments the stream of wax solidified, the bladder and the urethra were laid open, and the cast was extracted. The second cast was taken in the same manner from an infant two months old. The third and fourth casts were taken from infants aged six and nine months respectively. In the two latter cases

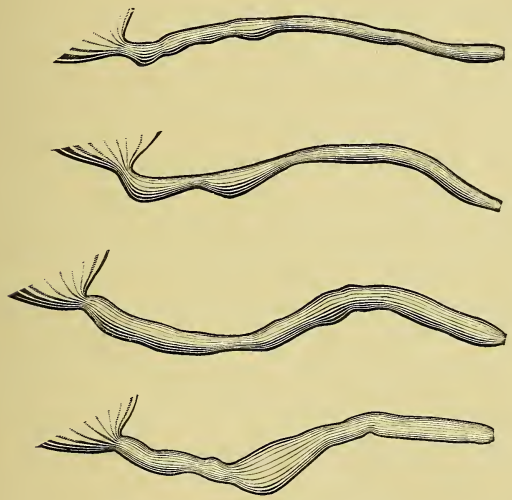


FIG. 53.—Casts of the Infantile Urethra.

the prepuce was surrounded by a ligature to prevent the escape of the injection, which was forced into the bladder under a pressure almost sufficient to rupture that organ. In comparing these casts the fact already pointed

out is apparent, namely, that *the calibre of the urethra depends on the degree of intra-urethral distention, being approximately uniform if the distending force is slight; but showing marked irregularities on forced distention, so that no one part can be taken as a criterion of the dimensions of another.*

It is an incontrovertible fact that a stricture may narrow the stream of urine or occlude it entirely; but in order to do this it is evident that it must, in the light of what has been said on the subject, be a well-defined stricture, and be capable of demonstration by instruments which do not dilate the urethra to a greater degree than is exerted by the passage of the stream of urine. We have seen that the over-dilated urethra exhibits well-marked points of contraction which are not perceptible under a degree of pressure equivalent to that exerted by the passage of a stream of urine. Therefore those constrictions which are only elicited by over-dilatation of the urethra can in nowise be considered as acting as points of increased friction or of retarding the stream, and are as innocuous from this point of view as if they never had existed. Urethral coarctations which are insufficient to narrow the stream of urine are not strictures in the true sense of the word, and by some writers do not receive recognition. Sir Henry Thompson defines stricture as "a deposit of lymph around the canal of the urethra at some point, which, not permitting it to open to the pressure of the stream of urine, *narrows the current to a greater or less extent.*" Taylor aptly says: "To my mind a canal may be said to be the seat of stricture when its calibre is reduced below that which nature requires it to be in the performance of its functions." The lumen of the male urethra is such a variable quantity that no definite size

can be fixed as the one which would constitute the limit between a strictured and a non-strictured urethra.

Since pathogenic properties have been attributed to even the slightest coarctations in the dilated urethra, their recognition is necessary. We may, therefore, divide strictures into two classes, the true and the false, or, in the generally accepted classification of strictures, of large and small calibre. *Strictures of large calibre may be defined as those points of narrowing in the urethra which are not of sufficient extent to retard the flow or narrow the stream of urine. Strictures of small calibre are those points of narrowing in the urethra which are of sufficient extent to retard the flow or narrow the stream of urine.* In referring to stricture of large or small calibre in the remainder of this work this definition will be strictly adhered to. There should be a wide distinction drawn between these two varieties of stricture, for a stricture of large calibre may be, and often is, perfectly innocuous, but the baleful effects of a stricture of a small calibre are too often made manifest. By obstructing the flow of urine it may be the starting-point in a series of calamities which not infrequently terminate the existence of the patient, as many a surgical kidney can attest.

CHAPTER XXIII.

STRICTURE OF THE URETHRA.

Etiology.

Stricture of the urethra may be due to a variety of causes, chief among which are the following:

1. Tonic contraction of the circular muscular fibres of the urethra, producing spasmodic stricture.

2. Neoplasms and retention cysts which encroach upon the lumen of the urethra.

3. Urethral and peri-urethral exudates, of an inflammatory origin, which have not undergone organization.

4. Cicatricial contraction following injuries and caustic applications.

5. *Gonorrhœal infection of the urethra, which produces in its chronic form a specific type of urethritis which goes on to the formation of stricture tissue.*

The first three varieties are not, in the strict sense of the word, strictures, and as they have but little bearing on the subject under discussion they will be considered but briefly. Spasmodic stricture is produced by a tonic contraction of the circular muscular fibres of the urethra. These fibres are present to a marked extent at the apex of the prostate gland and in the membranous urethra, where they form the external sphincter of the bladder. It is the inability to relax at will the sphincteric action of these muscular fibres that produces the retention of urine

that is so frequently a concomitant of operations on the rectum or perineum. This variety of spasmodic stricture is but transitory in its nature and is entirely foreign to the subject on which this article is written. True spasmodic stricture not due to such causes as the above is very rarely met with, and where present it will usually be found associated with some pathological condition of the urethra, most frequently a granular urethritis with the formation of stricture tissue *at the site of the spasmodic stricture*, the latter being merely a muscular spasm engrafted on an organic lesion. A case recently under the writer's observation is so typical of this variety of stricture that it is here briefly reported:

A gentleman, while still a youth, contracted a gonorrhœa which invaded the posterior urethra and set up a cystitis. After a few months this was followed by retention of urine requiring the use of a catheter. Since that time, which extends over a period of twenty years, retention has been constant. On examination a No. 27 French steel sound could be readily passed into the bladder, although it was firmly grasped at the bulbo-membranous urethra. A No. 5 French soft bougie was grasped with equal firmness at the same place. To test this point an endoscope tube was passed through the stricture and withdrawn until its extremity rested against the anterior surface of the stricture. A filiform bougie was then passed along the tube and through the stricture, by which it was tightly grasped, demonstrating the presence of a muscular element. The endoscopic examination showed that at this situation patches of the urethra had undergone cicatrization, and it is probable that it was the irritation due to the contraction of the cicatricial tissue on the terminal filaments of the nerves that caused the spasm of the muscular

element of the stricture. External urethrotomy was performed. The division of the stricture restored at once, and permanently, the patient's ability to urinate at will without the use of a catheter.

Strictures resulting from the encroachment of new growths or the formation of retention cysts are not, in the strict sense of the word, strictures; their consideration further than the mere mention of their existence would be to encroach upon the space intended for the consideration of subjects more relevant to that under discussion. It should not be forgotten, however, that all the obstructive symptoms of a true stricture may be present; and in the papillomatous form of tumor there may also be present an obstinate urethral discharge.

Strictures produced by urethral and peri-urethral exudates of an inflammatory nature, which have not undergone organization, are sometimes called soft strictures, and sometimes inflammatory or irritable strictures. They owe their existence to a recent and perhaps still active inflammation of the urethra, usually acute gonorrhœa. In acute urethritis the mucous, submucous, and occasionally the cavernous tissue is infiltrated with serum and leucocytes. In addition the epithelium is stimulated to increased cell proliferation, the result being a urethra with thickened walls and diminished resiliency, which may be of such a degree as to narrow the stream of urine, and for the time being be classed among the strictures of small calibre. On the subsidence of the inflammation the urethra gradually returns, in the majority of cases, to its pristine condition, but in a respectable minority, resolution may not be complete. A condition of chronic infiltration may persist for a time, to either ultimately undergo absorption, or, in rare cases, organi-

zation, with the production of true stricture. There are too many observations confirmatory of the latter change to permit of its being controverted, but I venture to predict that the pathological investigations of the future will show, if it has not already been demonstrated, that this process in the formation of true stricture is far from being as common as is generally supposed.

Under the head of traumatic stricture are classed all strictures resulting from traumatism, such as direct injuries from without or from within, as by falling astride of a rail, or by the unskilful use of instruments, or the application of caustic or corrosive injections. When the urethra has been subjected to a traumatism of such a degree of severity as to lacerate it, a splice of new tissue fills the rent and the foundation of a stricture is laid. If the rent be small, the plastic material laid down to repair the injury may not be sufficient to produce, by its subsequent cicatrization and contraction, a perceptible diminution in the expansibility of that portion of the urethra, and no stricture results. If, however, the laceration is severe, as occurs in complete rupture of the urethra, with separation of the torn ends, the resulting cicatrization of the new material produces a most intractable stricture, which requires the utmost watchfulness and patience in order to maintain a sufficient patency of that portion of the urethral canal. The rapidity with which this variety of stricture forms is astonishing, and is in marked contrast to the formation of the next variety of stricture. The following case illustrates this rapidity of stricture formation: It was a complete rupture of the membranous urethra, with extravasation of urine, and was treated by retrograde catheterism. A soft catheter was retained in the urethra for three days, after which a No. 28 French

steel sound was passed with ease on every alternate day for a period of three weeks, when the treatment was abruptly terminated by the elopement of the patient from the hospital. Five weeks later the patient reapplied for treatment. An examination of his urethra showed that there were good reasons for the sincerity of the penitence he manifested for his self-imposed curtailment of his treatment. The cicatrization of the new material that sealed the torn ends of the urethra had entirely occluded the lumen of the latter. The perineum was riddled by fistulous openings, through which micturition was painfully accomplished. The upshot was a perineal section and a most commendable determination on the part of the patient to continue indefinitely, and with the utmost assiduity, the passage of the sounds upon himself.

The obsolete treatment of breaking a chordee was doubtless the parent of many a stricture, although the urethral rent must in most cases have been very small. It is not uncommon, however, for accidents to the urethra, that at the time were considered but trivial, to be productive of strictures, usually of a valvular nature, that seriously impede the passage of the urine.

In cases of traumatic stricture, even where the stricture is extensive, a dependent or associated urethral discharge is extremely rare. This point will be referred to in consideration of the next and the last variety of stricture, which comprises the strictures that are formed by the conversion of the granulation tissue of chronic urethritis into stricture tissue. The pathology of this variety of stricture has been explained in the chapter on the pathology of chronic anterior urethritis. It will be unnecessary, therefore, to enter into the details of that subject at the present time. The reader is simply reminded where

to look for the elucidation of pathological problems that in the present chapter may be ignored.

Strictures due to chronic gonorrhœa comprise the great majority of strictures to be met with in the urethra. To hazard an estimate at the proportion of all strictures which would come under this class, would be to make a statement that might be so inaccurate as to be misleading. The statement already given, that it preponderates numerically over all the other varieties of stricture taken together, certainly is a safe estimate even if it is indefinite.

A chronic urethritis, or a gleet, may exist without the pre-existence of a stricture, but the variety of stricture under consideration cannot exist without the precedence of a chronic urethritis, which bears the relationship to the stricture of cause and effect. The above assertion is in direct antagonism with the views taught by Otis, and is the vital point around which so much argumentative literature has centred. The teaching of Professor Otis was not only widely disseminated, but received a general credence from the medical profession of this country, and soon established a new school of urethral surgeons. The followers of the new and the adherents of the old school of genito-urinary surgeons were soon engaged in a heated controversy which waged for years around the battle-field of stricture with varying degrees of success on either side. The two schools still stand arrayed against each other, although the line of demarcation has become less distinct; many of the foremost adherents of the new school have recanted, at least in part, the doctrine they once enthusiastically upheld. The theories promulgated by Otis concerning the calibre of the urethra, and more especially on the causation of gleet, were so antagonistic to those pre-

viously entertained, and have had such an important bearing on the treatment of both stricture and gleet, that they will be entered into somewhat in detail as a preliminary to their further consideration. Condensed into the smallest compass, Otis taught that the normal urethra was practically a tube of uniform calibre, which bore a definite proportion in size to that of the penis, and that any deviation from the uniformity of its calibre whereby the dilated urethral canal was narrowed, was not only pathological in itself, but was also capable of producing or perpetuating a gleet. To quote his own words, in his book on "Stricture of the Male Urethra," page 20:

"As the urine is propelled through the urethral canal it impinges with more or less force upon any contracted or salient point. More or less hyperæmia necessarily ensues, and a condition is soon established well adapted to prolong an existing gonorrhœa, or which, upon slight additional cause, such as venereal excitement, or even an unusually acrid condition of the urine, may result in the origination of a muco-purulent or purulent secretion. *We may hence affirm as a most important axiom that the slightest encroachment upon the calibre of the urethral canal is sufficient to perpetuate a urethral discharge, or even, under favoring conditions, establish it (de novo) without venereal contact.*"

On page 75 of the same work there appears the following:

"Chronic urethral discharge, commonly called gleet, is the signal which nature hangs out to notify the intelligent surgeon that an obstruction to the normal working of the muscular apparatus of the urethra has occurred, that plastic material laid down in the antecedent inflammatory condition has begun to contract the normal urethral calibre, whether it be twenty or forty millimetres in circumference, and that nothing short of a complete

restoration of the normal calibre will afford a permanent cure. Sandal-oil may stop it for a time, injections of innumerable variety may any one remove it, and thus the case goes on getting, as many such cases will affirm, a new clap for every woman looked at, until finally an attack of retention of urine calls attention to the fact that the patient has a strictured urethra."

The teaching of Professor Otis, that gleet owes its origin and existence to a stricture, however slight it may be, and the natural sequence that the cure of the gleet depends on the removal of the obstruction to the passage of the urine, reduced the treatment of chronic urethral discharge to a very simple basis; first find the stricture and then remove it. The simplicity of this rule, the dogmatic manner in which it was enthusiastically taught, the mathematical precision of it, as it were, by which the road to success in urethral surgery was easily trod, contrasted so strikingly with the devious and uncertain ways in which the older surgeons taught us to wander, that it is not to be wondered at that an army of practitioners enthusiastically and blindly adopted this rule with the result that in the treatment of gleet there has been more pernicious activity displayed, more unjustifiable operative interference than in any other department of surgery. The American literature on this subject is still strongly tainted by the views of Otis, and his disciples have ample authority behind which to entrench themselves in the defence of their views, for it is only necessary to refer to the standard works on the subject to determine the point in their favor by the weight of authority. To illustrate what I refer to, I have selected the following from the works most frequently used by the American practitioner.

Holmes's "System of Surgery" (American edition, vol. ii.), page 980:

"The author does not give sufficient prominence to the fact that the vast majority of gleety discharges depend upon the presence of stricture."

Ashhurst's "Text-book of Surgery," sixth edition, page 1050:

"One of the earliest symptoms of stricture in many cases is the presence of a slight gleety discharge."

"Diseases of the Urinary and Male Sexual Organs," by William T. Belfield, page 90:

"That a gleety discharge which has made the usual rounds among physicians and has for years resisted medication by injections and the passage of large sounds (No. 12 to 16 English) is often maintained by a slight constriction of the urethral calibre, and completely and immediately relieved by the division of such constriction, I have repeatedly demonstrated."

"Genito-urinary Diseases with Syphilis," by E. L. Keyes, page 135:

"This frequency of micturition is the symptom of stricture, next to gleety discharge, which is least often absent."

Perhaps the most ardent advocate of the dependence of gleet upon stricture that has appeared in recent years is G. Frank Lydston, whose work on stricture of the urethra, issued during the past year, would almost out-Otis Otis. The following is extracted from page 142 of this work. Speaking of strictures of the pendulous urethra, he says:

"They are a potent cause of chronic urethritis and gleet, and explain the obstinacy of very many apparently incurable cases of urethral discharge. Even when they are not, strictly speaking, the cause of chronic inflammation they invariably tend to perpetuate it. If the profession had nothing else for which to thank Dr. Otis it would be still under lasting obligations to him for his demonstration of the true pathological condition in the majority of these obstinate cases of gleet which have so long been the *bête noire* of the surgeon."

To appreciate what Otis considers as coming within the limits of stricture, it is necessary to glance at the records of his own cases for which he has performed urethrotomy, and we shall see frequent illustrations of strictures ranging from thirty to thirty-five millimetres. In his work on "Stricture of the Male Urethra" he has tabulated the number and size of the strictures in one hundred and seventy-four cases as follows:

Size of Strictures in Millimetres.	Number of Strictures.	Size of Strictures in Millimetres.	Number of Strictures.
1	1	23	18
1½	1	24	36
2	1	25	44
3½	1	26	27
5	1	27	15
11	1	28	39
12	3	29	20
14	5	30	61
15	8	31	9
16	3	33	7
17	1	34	18
18	11	35	9
19	15	36	5
20	12	38	1
21	8	39	1
22	19		

The total number of strictures in this table is four hundred and one, of which three hundred and twelve, or

about seventy-five per cent., range from twenty-four millimetres upward, and twenty-six per cent. are thirty milli metres and upward. Many of the strictures of thirty millimetres and upward are only from one to four millimetres smaller than the given size of the urethra. Without stopping to consider the propriety of calling these strictures, we must deny most emphatically that they would interfere with the passage of a stream of urine by acting as a point of increased friction, for even the most capacious urethra rarely emits a stream of urine larger than a No. 25 French sound, and a fair average of the size of the stream of urine may be given as about eighteen millimetres in circumference. This estimate, however, is given by the writer simply from observation, and not from actual measurement. It is difficult to comprehend how a stream of urine ranging from fifteen to twenty millimetres can be retarded in its passage through a urethra which does not manifest points of constriction until it is dilated to a size of thirty millimetres or upward.

There is a very general misapprehension of the pressure

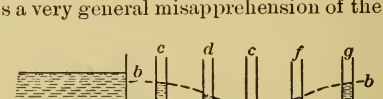


FIG. 54.—Diagram Illustrating the Pressure of a Stream of Urine against a Stricture.

exerted against the urethra by the passage of a stream of urine. It is generally supposed that where there is an obstruction to the passage of a stream of urine, as in

stricture of the urethra, there is an increased pressure against the urethral wall at the constricted area. That this is an error and that the reverse is true, is capable of demonstration by reference to the works on hydraulics from which Fig. 54 is taken.

Let the urethra, for the sake of illustration, be represented by the tube *a a* in Fig. 54, *s s* representing a stricture. It will be found that in the passage of the stream the least pressure will be exerted against the urethral walls at the strictured area *s s*, as is shown by the height of the water-pressure line, *b b*.

CHAPTER XXIV.

STRICTURE OF THE URETHRA.

Symptoms.

The symptoms of stricture of the urethra vary with the nature, size, and location of the stricture. A stricture of large calibre, that is, a coarctation of the urethra so wide in its calibre that it does not narrow the stream of urine, may give negative symptoms. There is an absence of frequent micturition, and the stream of urine retains its force and volume. There may or may not be a coincident urethral discharge; *if present it is not a symptom of the stricture, but of a coexisting chronic urethritis, of which the stricture is in all probability a sequel.* If there is no discharge it may indicate either that the associated urethritis is of so mild a grade that its secretion is imperceptible, although the urine in this case will contain pus threads, or else that the antecedent urethritis has undergone a cure by the conversion of the affected area into cicatricial tissue; or, again, the stricture may be the resultant of a traumatism or of a urethral chancre, in which case a chronic urethritis plays no part in the causation of the stricture.

If we are to believe all that is written on the subject, strictures of large calibre play an important *rôle* in the causation of peculiar reflex phenomena. We not infrequently hear of the incision of the meatus, or of a strict-

ure of large calibre in the pendulous urethra, giving immediate relief to a spasmodic stricture of the deep urethra. The explanation given of this phenomenon is that the stricture sets up a peripheral irritation of the urethral nerves that is manifested by a spasm of the deeper muscular structures. So many competent writers have recorded their observations on this reflex phenomenon of strictures of large calibre, that the possibility of its occurrence must be conceded; at the same time I must confess to never having seen such a case, and time and experience serve but to make me sceptical on the subject. I fancy that it has happened in many of these cases that before the incision of the meatus or stricture a small sound was used in an irritable urethra and excited a temporary spasm of the muscles by catching on the folds of the undilated urethra. The subsequent division of the stricture would permit the passage of a larger sound and reduce the liability of its being caught, and consequently there would be no spasm and an apparent cure of an imaginary stricture. I have met with cases similar to this where patients had been referred to me for the treatment of stricture, the history being that a small instrument could not be passed; on examining the patient a large instrument, gently introduced, would fairly drop into the bladder. It may be well, in order to avoid confusion, to remind the reader that this reference to reflex phenomena does not relate to spasmodic stricture where there is a combination of organic and muscular elements in the same stricture; but to the reflex phenomena reputed to be manifested at some point distant from the stricture.

The most varied reflex symptoms have been attributed to strictures of large calibre, such as epileptic seizures,

paralysis, and various forms of neuralgia. At one time there seemed to be a mild form of mania among physicians on the subject, but we hear less and less of it as the pathology of this and its allied diseases is better understood.

To be brief, the symptomatology of stricture of large calibre is practically nil, and a careful observer of his own case might have such a stricture and yet be totally, and we may add happily, oblivious of the fact that any permanent pathological changes have taken place in his urethra.

The older writers on the subject had good reasons for ignoring this form of stricture, and it is a matter of regret that the voluminous, and often pernicious, literature on the subject renders it necessary to give it consideration in this article.

There are two symptoms, not necessarily of stricture, that are frequently met with in this class of cases, namely, dribbling of the urine and forking, twisting, or scattering of the stream. The first is due to a rigid, sclerosed urethra, the result of an antecedent gonorrhœa, failing to collapse and expel the urine it contains until some time after the act of urination. The second is due to the shape of the meatus. Patients often worry so much over this trivial affair that it is well to allay their anxiety by an explanation of its mechanism. The meatus is a normal point of narrowing, and gives the shape to the stream of urine just as the nozzle of a hose gives form to its stream. If the nozzle is irregular in outline, so will the stream be irregular in outline. If the meatus is partially sealed, as is often the case in chronic urethritis, the stream will probably be irregular in form. Many urethræ that are perfectly healthy emit a stream that is

anything but regular; but let a patient under such circumstances contract a urethral disease, and he is prone to consider, what he had previously ignored, as a symptom of the greatest magnitude. It is well, therefore, to remember that the form, but not necessarily the force or volume, of the stream of urine is dependent solely on the shape of the meatus, and is independent of the deeper structures of the urethra.

Should a stricture of large calibre be treated? Given a urethra with points of contraction capable of detection only by instruments which dilate the urethra to a greater extent than is exerted by the passage of a stream of urine, or, to be more definite, we will say that a No. 26 French sound passes without being obstructed in its passage, or being held on its withdrawal, also that there is no disturbance in the function of micturition, should such a urethra be subjected to instrumental or other treatment, simply because we have succeeded in finding some points in the urethra that are narrower than others? If this is all we have to consider in the case there can only be one answer, and that is to leave it alone, for its treatment is unnecessary. *The mere presence of a stricture of large calibre is not of itself a justification for its removal.* It is true that by continued contraction it may become a stricture of small calibre, and the possible forerunner of a serious malady, but comparatively few of these strictures pursue this course to such a termination, and it seems to me that the treatment of a stricture of large calibre, merely from a prophylactic point of view, would be as unjustifiable as would the removal of the healthy appendix vermiformis, because it serves no useful purpose and might, if left untouched, become the source of an appendicitis.

It usually happens, however, that strictures of large calibre at the time they come under the observation of the genito-urinary surgeon are associated with a chronic urethritis, for which the patient applies for treatment. In the treatment of the latter disease it is often necessary to use means for its cure that removes at the same time the points of narrowing to which the term stricture of large calibre has been given ; but in this case it is not the stricture that is the object of treatment, but the associated urethritis, and were the latter cured, and the former left intact the result, as far as the patient is concerned, might be just as good.

The treatment, therefore, of stricture of large calibre, should not be undertaken except where there is an associated disease, such as a chronic urethritis, which then becomes the paramount object of treatment. I have for this reason chosen to consider its treatment, apart from the present article, and have already included it in the chapter on the treatment of chronic urethritis.

The symptoms of stricture of small calibre, that is, a coarctation of the urethra, whose calibre is so small that it narrows the stream of urine, depends chiefly on the amount of obstruction that exists to the passage of the urine. In mild cases the patient, if a close observer, will simply notice a slight diminution in the force and volume of the stream, and a correspondingly greater length of time required to empty the bladder. In proportion to the degree of obstruction will be the severity of these symptoms. Where the obstruction is marked, for instance, where the stream of urine is the size of a knitting-needle or less, frequency of micturition with vesical tenesmus is often a prominent and painful symptom. In these cases the urethral obstruction throws increased work on

the bladder, which either undergoes hypertrophy, with diminution of its capacity, or else becomes atonic and fails to completely empty itself, and a certain amount of urine remains in the bladder. It therefore requires the addition of but a little urine in either case to fill the bladder and bring on a renewed attempt to empty itself. In extreme cases where the urine escapes drop by drop, especially if a cystitis is superadded, we have a picture of agony that is pitiable to behold. The patient's entire time is devoted to efforts, often futile and always painful, to empty his bladder. No sooner has he attained momentary relief by the passage of a few drops of urine than the desire to repeat the effort returns with agonizing and uncontrollable force, and thus the case goes on from bad to worse, until the patient, unless relieved, sinks from sheer exhaustion or from suppression of urine.

When a patient has suffered for some time from urethral obstruction, serious changes often take place, not only in the bladder, but also in the ureters and kidneys. As a result of the repeated efforts of the bladder to overcome the ob-

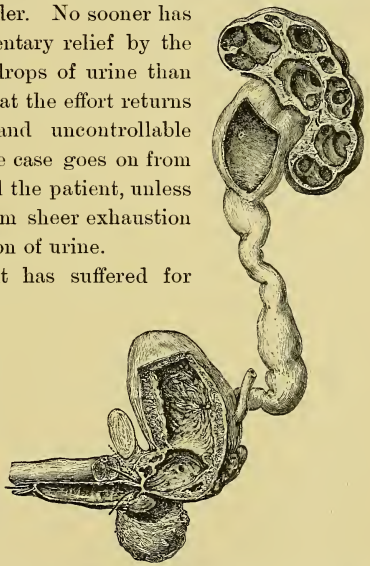


FIG. 55.—Result of Stricture of the Urethra. The figure shows the effects upon the bladder, ureter, and kidney, of long-standing stricture of the urethra. (From a specimen in the Middlesex Hospital Museum. Morris.)

struction, the pelvis and ureters are often dilated, the latter sometimes to such an extent that the kidney substance is thinned out to form a saccular dilatation, whose thin walls and atrophied secreting substance serve but poorly the purpose for which it was intended (Fig. 55). In a case of this kind, in which I performed perineal section, I was able to pass a Thompson's searcher through the perineal opening, into the bladder, and along the ureter to the pelvis of the kidney, where it could be felt through the abdominal wall.

If infection of the bladder takes place when the urinary tract is in this condition, as may readily happen by the use of unclean instruments, infection of the whole urinary tract rapidly follows. To the cystitis is then added a ureteritis and a pyelonephritis, the onset of which is marked by chills and fever; the urine becomes purulent and the patient often dies in a typhoid condition from septicæmia or from suppression of urine.

The urethra also frequently undergoes dilatation and thinning at a point immediately posterior to the stricture, and it not infrequently happens that during some expulsive effort a little tear in the mucous membrane takes place, through which a few drops of urine are forced. This is repeated at the next act of urination; a peri-urethral abscess results, the skin over the abscess breaks down, and a fistulous communication is established with the urethra, at a point posterior to the stricture through which the urine escapes in whole or in part. This is a good illustration of the crude methods which Nature sometimes adopts to accomplish her own cures.

A symptom of a close stricture is the inability to expel the stream but a short distance, or it may drop di-

rectly from the meatus. The same symptom may be present, however, in paretic conditions of the bladder, or in obstruction at its neck, as in prostatic hypertrophy.

A urethral discharge is seldom a concomitant of long-standing close strictures, for the reason that a sufficient time has usually elapsed for Nature to have effected a cure of the antecedent granular urethritis by its conversion into stricture tissue.

A patient who has a stricture of small calibre will frequently suffer from chills, followed by fever which simulates malaria except in its periodicity. These cases are always grave, since the slightest urethral instrumentation may be followed by repeated chills and suppression of urine. All these symptoms will usually disappear with the removal of the stricture.

CHAPTER XXV.

THE LOCATION OF STRICTURES OF THE URETHRA.

No part of the urethra is exempt from the possibility of stricture formation. Strictures are, however, never found in the prostatic urethra, except as the result of severe traumatism, such as may be inflicted by the extraction of large vesical calculi by the median or lateral incision.

The situation in which strictures are most prone to be found will depend somewhat on what is our idea of stricture. Thus, Sir Henry Thompson found strictures much more frequently at the subpubic curvature than elsewhere, while Otis found them most frequently near the meatus, their number decreasing with the depth of the urethra, and consequently least frequent where Sir Henry Thompson found them the oftenest. The latter's observations were made from the immense number of urethræ to be found in the museums of Europe, and, consequently, every stricture he observed must have contracted the urethra sufficiently to be capable of ocular demonstration; in fact, every stricture must have been, according to the definition in this article, a stricture of small calibre. On the other hand, Otis gathered his statistics mainly from observations made on the living subject, with the urethrometer, so that his list includes both strictures of large and those of small calibre. Hence the probable cause of the discrepancy between

these observers, each endeavoring to obtain an accurate result, but basing their observations on different methods and ideas of stricture, have arrived at radically different conclusions.

If we recognize every irregularity in the dilated urethra as a stricture, then will we find strictures most frequently in the pendulous urethra. If, on the other hand, we only recognize as strictures points of narrowing that diminish the size of the stream of urine, then will we find them most often in the bulbo-membranous portion of the urethra. There are good anatomical reasons why strictures should be found most frequently in the latter situation, for it is in this situation that the urethral lacunæ are most numerous, and it is here that the area of greatest muscular activity is found, both of which tend to retard resolution of existing urethral inflammation, and predisposes to the localization of the gonorrhœal process, with its consequent formation of granulation tissue and subsequent stricture formation.

Mr. A. P. Gould and Mr. Reginald Harrison attempt to explain the frequency of stricture formation in the bulbo-membranous urethra on the supposition "that this being a more or less horizontal portion of the urethra, the urine and morbid secretions are less liable to be completely evacuated and tend to leak through the damaged urethra." That this hypothesis is tenable will be doubted when we reflect that the bulbous portion of the urethra is grasped by a muscle whose function is to completely empty the urethral canal, and that the posterior urethra, owing to its forming, during vesical distention, the neck of the bladder, is the part most intimately and longest in contact with the urine, yet it is the part of the urethra least liable to stricture.

In connection with this subject it may be added that a number of writers have expressed their belief that when the urethra is inflamed it is often denuded, in patches, of its epithelium, and as a result the urine tends to leak through the mucosa at these places. Nature offsets this by laying down plastic material to act as a barrier to the infiltrating urine; cicatrization of the plastic material is liable to ensue, resulting in stricture formation. This is at first sight a very plausible theory, but as it leaves out of consideration the parasitic cause of the disease, it fails to explain the long-continued infectious nature of the discharge emanating from the damaged mucosa; nor does it take into consideration that in chronic urethritis the epithelial erosions, if present, are almost microscopic in size, and that stricture formation does not follow the denudation of the epithelium produced by such agencies as the endoscopic application of a strong solution of nitrate of silver.

Tight strictures are usually single, but there may be more than one, and if we include strictures of large calibre in the category, it is possible to find quite a number in the same urethra. Otis records a case where there were fourteen distinct strictures; while Thompson says that he has never seen more than three or four. In the writer's somewhat limited experience he has never seen more than two strictures of small calibre in the same urethra.

CHAPTER XXVI.

STRICTURE OF THE URETHRA.

Treatment of Strictures of Small Calibre.

How shall we treat a stricture of the urethra? We have a mechanical obstruction to the flow of urine, how shall we remove it? What means shall we adopt that will accomplish this object most satisfactorily and with the least risk to the patient?

The answers to these questions will depend on three factors, namely: the circumstances of the patient, the nature of the stricture or strictures, and their location. If the patient is in an hospital, time is usually an important object, and we may be justified in adopting heroic measures, as the patient is completely under our control, and there is less danger of unfortunate results arising from heroic treatment. Under these circumstances, in the great majority of cases urethrotomy would not only be justifiable, but be highly proper, as it restores at once the calibre of the urethra. Besides many of these cases only come to the hospital because immediate relief is imperatively necessary. If, however, the patient is compelled from motives of business or secrecy to continue during treatment at his daily occupation, then milder measures are indicated; time becomes of less importance, and in these cases we have recourse to gradual dilatation in preference to urethrotomy.

As regards the second factor, the nature of the stricture, there are some that are merely mucous folds, or valvular strictures, of such feeble resistance that it would be needless surgery to subject the patient to the risks of a urethrotomy in order to remove them. Many of these strictures are so tight that they seriously obstruct the passage of the stream of urine, yet at a single sitting they can be dilated to almost the full calibre of the urethra, by the passage of sounds of progressively increasing size. On the other hand, there are many strictures that, from their density and unyielding nature, dilate with such difficulty that urethrotomy gives the best results. Other strictures are resilient or elastic, that is, they yield to dilatation with surprising readiness, but contract to their pristine closeness almost immediately afterward. These strictures are usually situated at the bulbo-membranous portion and seem to have a *muscular* as well as a fibrous element in them, which may account for their resilient character. This variety of stricture does not yield permanently to dilatation, and urethrotomy is indicated.

Other strictures are, owing to their inflamed condition, or to the abnormal sensibility of the patient, acutely painful on manipulation. In these cases it is better to restore the urethra to its normal calibre at once, by urethrotomy, than to harass the patient by prolonged, painful, and generally futile attempts to dilate the stricture, which usually results either in increasing its irritation and tenderness, or in the patient exhibiting his good sense by betaking himself to some other surgeon more considerate of his feelings.

The last factor, the location of the stricture, has an important bearing on its treatment. For instance, a stricture of the meatus should always be treated by incision, never

by dilatation, while a stricture in the membranous urethra is usually best treated by dilatation, unless it is very dense or resilient, when an external or a combined external and internal urethrotomy is to be preferred.

As a general rule it may be said that the nearer a stricture is to the meatus the greater the safety of internal urethrotomy; and *vice versa*, the deeper the stricture the greater the danger, consequently, other things being equal, the indications for urethrotomy diminish with the depth of the stricture.

There is still another condition that sometimes exerts a determining influence on the mode of treatment, and that is the condition, not infrequently met with, where, from some peculiar nervous susceptibility of the patient, or organic disease of the kidneys, the passage of the sound is followed by urethral chills and fever, which precludes the further use of the sounds and necessitates a urethrotomy. The curious fact is often observed that a patient will have a severe attack of urethral fever after the gentlest passage of the sounds, and yet the same patient will stand a urethrotomy and the unkindest sort of urethral manipulation without any constitutional disturbance whatever.

Bearing in mind the foregoing indications for treatment we may formulate the rule that, *when the urethra can be restored to its normal calibre equally as well by means of gradual dilatation as by cutting, the preference should be given to the former on account of its greater safety and freedom from unpleasant sequelæ.*

In considering the methods of treatment I have purposely omitted to mention two methods in somewhat general use, namely, rapid divulsion and electrolysis.

The former method has a somewhat limited sphere of

usefulness in the rapid divulsion of a tight stricture up to a size that will permit of the proper use of the sounds, or the urethrotome, as will be indicated when we come to the consideration of this variety of stricture.

The subject of electrolysis is one into which I cannot enter with credit to myself, or with justice to either its opponents or advocates. My experience with it has been nil, but from what I have seen of it in the hands of others I am inclined to the belief that the gentle but prolonged pressure exerted by the conical-tipped electrode against the stricture, has perhaps a more beneficial effect, from a mechanical stand-point, than from any electrolytic effect to which the entire benefit, if any, is usually ascribed. In one case in which the operator was baffled in his attempts to pass an electrode through a stricture, I succeeded without difficulty in passing the same electrode without using any electric current whatever. Dr. Robert Newman has claimed very good results from this method of treating strictures, but others have not been able to obtain the same, and many strictures have undoubtedly been made worse by it. We may sum the matter up by saying that electrolysis, as a means of treating stricture, has been tried and found wanting, and it is needless to trouble the reader with a method of treatment that is fast becoming obsolete.

As each urethra is, to a certain extent, a law unto itself, and as there are not, and never will be, fixed and unalterable laws to govern its treatment, it would be both absurd and useless to attempt to dictate what should be done in every case. The general indications for treatment may be given, but the exact mode of treatment which should be adopted in each case must be left to the discretion of the surgeon. He must rely on his own brains just as

much as on the word of authorities. Above all he should avoid hobbies, for the man who rides a hobby in urethral surgery is a dangerous man. The hobby of indiscriminate urethrotomy is particularly dangerous, and has often brought disaster on the patient and undeserved disgrace on the operation.

If we will bear in mind what has been said on the treatment of stricture in the present chapter, and in the chapter on the treatment of chronic urethritis, it will be unnecessary to enter further into the treatment of strictures which offer no particular mechanical difficulty—strictures, for instance, that will readily permit the passage of a No. 10 French soft bougie. Such a stricture can be readily treated by either gradual dilatation, or dilating urethrotomy, as the operator considers best.

Strictures whose calibre is so close that the passage of any instrument is difficult or impossible often offer very serious problems for the surgeon to solve, and on his judgment and dexterity frequently depends the life of the patient.

For the purpose of illustration we will suppose that we have a case of very tight stricture to treat. What should be the *modus operandi* by which we endeavor to overcome it? In these cases the all-important primary object is to pass an instrument through the stricture—no matter how small it may be, its passage assures the ultimate success of the treatment, for the moment we have passed an instrument we become the master of the situation and no amount of patience and time need be considered as wasted if it is rewarded by the passage of the stricture.

The first thing to be done is to attempt to pass a small soft bougie; if it passes, well and good; if not, it should

be immediately withdrawn and a medium-sized conical steel sound (No. 24 French) should be passed along the urethra until the stricture is reached; the sound should be held firmly but gently against the face of the stricture for a few minutes. If it be now withdrawn, and is not held or grasped by the stricture, it is evident that it is unyielding, and that the tip of the sound has not entered its lumen. It more often happens, however, that the tip of the sound is appreciably held, on the attempt at its withdrawal, indicating that it has entered the lumen of the stricture. In this case the sound should be reintroduced, and gently but firmly forced against the stricture; counter-traction being made at the same time on the penis. This procedure should be steadily kept up for a period of ten or fifteen minutes, or longer, if necessary, when, if the stricture is not penetrated a sound about two millimetres (No. 22 French) smaller should be introduced along the tract made by the previous instrument, and the same procedure repeated. If this is done patiently and firmly, but without violence, it will be surprising how often the tightest and densest stricture can be brought under control. The philosophy of this method of treatment is simply that the path of least resistance is along the lumen of the stricture, and if we use instruments sufficiently large to be safe, and employ, not force but firmness and patience, this path can usually be traversed without either danger or difficulty and with the simplest appliances.

Where the stricture is deep in the urethra the passage of the sound may be materially assisted, and its position assured, by placing the index-finger of the left hand within the rectum and against the stricture. By this means we become cognizant of the exact position of the

sound, and if we are familiar with the anatomical relation of the parts, the operation can be carried out with almost the accuracy of a dissection, and the formation of a false passage guarded against. *The formation of a false passage indicates that the operator has been a bungler; that he has resorted to violent methods, or the improper use of instruments.* Its occurrence bears with it the stamp of condemnation and should not be condoned. It is indicated by the sudden slipping forward of the sound, and its withdrawal without being grasped or held by the stricture, the removal of the sound being followed by a free hemorrhage. When this unfortunate accident occurs the further treatment of the case should be for a time aban-



FIG. 56.—Filiform bougies.

doned, until the urethral rent has healed. If urinary extravasation should take place it should be immediately dealt with by free incisions into the infiltrated tissues.

If we fail in the passage of a sound, a syringeful of olive-oil should be injected into the urethra and the filiform bougies tried (Fig. 56). The filiforms should be passed one by one, down to the stricture, until eight or ten are inserted. Then, taking the filiforms separately an attempt is made to insinuate one of them through the stricture. A little experience will soon enable the operator to tell whether the filiform is passing through or merely doubling on itself in front of the stricture. If there is a doubt on this point the rotation of the filiform will settle it. The unbent filiform rotates readily on its own axis, but if bent on itself, the arc its bent extremity

describes makes rotations either difficult or impossible. A great deal of patience and time may be required in this operation, but if it is crowned with success the reward is ample. Sometimes it will be advantageous to pass an endoscopic tube down to the face of the stricture, and observe, if possible, under artificial illumination, the situation of the orifice of the stricture, which, in the majority of cases, will be found nearer the roof than the floor of the urethra, on account of the greater liability to the formation of granulation tissue in the latter situation, and the consequent displacement upward of the lumen of the urethra. If the orifice of the stricture can be seen, it is sometimes possible to thread a filiform through it while it is under observation. The passage of the tube as directed will often facilitate the passage of the bougies by preventing their entanglement in the folds of the urethra and by distending the urethra at the point of stricture, which tends to dilate the orifice of the latter.

Granted that the filiform has been passed, we may congratulate ourselves on the completion of the most difficult and uncertain portion of the operation. We may now either retain the filiform *in situ* for from twenty-four to forty-eight hours, trusting to its retention to exert a

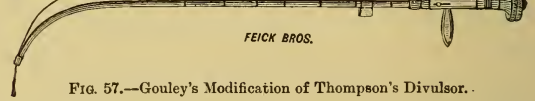


FIG. 57.—Gouley's Modification of Thompson's Divulsor.

continuous dilatation when a larger bougie will readily pass; or what is preferable, we may pass at once a tunnelled Gouley's or Thompson's divulsor (Fig. 57) over

the filiform, using the latter as a guide to the passage of the stricture, and divulse the stricture up to fifteen or twenty millimetres, when its further dilatation can be

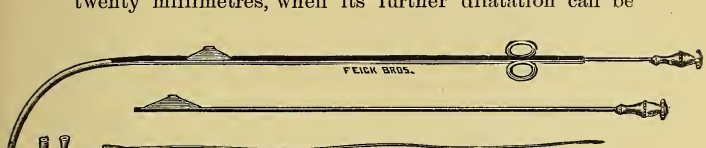


FIG. 58.—Maisonneuve's Urethrotome.

best accomplished by gradual dilatation, or by dilating urethrotomy, as the case may indicate. Of the two methods, continuous dilatation and rapid divulsion of tight strictures, I prefer the latter; the former is usually tedious and unsatisfactory.

Some surgeons use the urethrotome in the treatment of tight strictures. For this purpose a Maisonneuve's urethrotome (Fig. 58) is used. This instrument is threaded through the stricture in a similar manner to the passage of the divulsor, and the knife thrust from before backward. This procedure has but little to recommend itself, and has manifest disadvantages. The stricture is not put on the stretch at the time of its incision, and the liability to injure the healthy mucous membrane is so great that its use should be abandoned. We may safely say that the addition of this instrument to the surgeon's armamentarium is, except in very rare cases, unnecessary. No matter how tight a stricture may be, it is always pervious, unless it is the result of a complete laceration of the urethra with discharge of the urine at a point posterior to the stricture. It has been said that every stricture that is pervious to the passage of urine is also pervious

to instruments, consequently every stricture, with the exception of the rare impervious ones, can be penetrated by the proper use of instruments. This may all be very well in theory, but it does not always carry out in practice. The very best men have failed to pass a stricture after the use of the utmost patience and skill. It has happened a number of times in my own practice that I have succeeded in passing a stricture with the use of the medium-sized steel sound after I had failed to pass the filiform bougies. It is for this reason that I have recommended the use of the sound before resorting to the filiforms.

Strictures that prove impassable for urethral instruments of any sort are often exceedingly difficult to deal with. The patient may be, and usually is, suffering the torments of retention of urine. His demands for relief are imperative, and justly so, for his life depends upon it. To operate on his stricture may prove comparatively easy, but, on the other hand, it may be one of the most difficult operations that the surgeon can undertake. A good light, good assistance, and plenty of time, are requisites to its successful completion. If these are not to be had we may temporarily relieve the patient by suprapubic aspiration of the bladder, which, if the needle is small and inserted close to the pubic symphysis, is perfectly safe and may be repeated with impunity. Before aspiration came into vogue a trocar and cannula was used; it was inserted either above the pubes or through the recto-vesical wall immediately behind the prostate.

Impassable strictures are usually met with in the bulbo-membranous portion of the urethra. Many of them are traumatic in origin, and formed of dense, unyielding tissue. In these cases an internal urethrotomy is out of

the question, the stricture must be cut from without inward by dissection, as we have no guide on which to incise the urethra.

The technique of the operation is as follows : The perineum and pubes having been shaved, the patient anæsthetized, and in the lithotomy position, a grooved sound is passed along the urethra until its tip rests against the stricture. The tip of the instrument should now be depressed until it is felt in the perineum, at which point it should be exposed by an incision extending directly down to it. This incision will open the urethra immediately in front of the stricture. The margins of the incised urethra should be secured by two fixation sutures, one on either side, and an effort made to find the orifice of the stricture. This is often exceedingly difficult, and sometimes impossible, owing to the depth of the wound, and the difficulty encountered in preventing the blood from obscuring the field of operation. If a probe or filiform bougie can be passed it should be used as a guide on which to freely incise the stricture. If the orifice of the stricture cannot be found an attempt should be made to divide it, beginning at the anterior surface of the stricture, and carefully dissecting toward the bladder, keeping in the median line and within the limits of the cicatricial tissue, in the hope of striking the urethra at a point posterior to the stricture. This is a difficult and uncertain procedure, but with proper precautions is perfectly justifiable. It often happens, however, that we lose our landmarks and find that we are working in an unknown region, blindly groping in a bloody hole for a urethra we can neither see nor feel. Under these circumstances the temptation is great to rashly terminate what is an embarrassing and dangerous situation, by forcibly

accomplishing by foul means what we cannot accomplish by fair; by thrusting an instrument blindly onward in the direction of the bladder, entering the latter regardless of the situation of the urethra. Many an operation of this kind has been thus brought to an apparently brilliant termination, and many a patient has paid by the sacrifice of his life for this piece of surgical malpractice. The surgeon should abandon this operation the moment he meets difficulties that he fears may prove insurmountable or unduly prolong the operation, and in so doing need not feel embarrassed. He may and should have immediate recourse to another operation, which is much less dangerous than prolonging the search for the urethra in the perineal opening. I refer to retrograde catheterism, an operation, the steps of which are as definite as those of amputation. This operation is absolutely void of the uncertainty that attends and makes so hazardous the perineal method of operating on impassable stricture.

The method of operating as performed by the writer is as follows: Rectal distention is unnecessary; the distention of the bladder is, of course, not within our control; but even an empty bladder adds but little to the difficulties of the operation. Antiseptic precautions, it is needless to say, should be rigorously observed. Standing on the left side of the patient, who should be in the Trendelenburg position, the operator should make an incision in the middle line, extending from a point half an inch below the upper border of the symphysis pubis to a point two and a half inches above the pubes. This incision should cut through the skin and fascia, exposing the muscular aponeurosis. The finger now feels in the lower part of the incision for the notch which marks the

upper border of the symphysis pubis. At this point the knife is boldly thrust inward until its point is arrested by the cartilaginous junction of the pubic bones. *It is advisable to expose this part early in the operation, for it is easy to find, and the incision may be carried down to it with a total disregard for the abdominal contents.* It is also the principal landmark in the operation, for it marks not only the lowest limit of the deep dissection, and its exposure divides the muscular aponeurosis and separates the tendinous insertion of the recti muscles. The aponeurosis is now divided the entire length of the wound, and the recti muscles separated with the handle of the scalpel. Retractors should be used to separate the margin of the wound which exposes the transversalis fascia. The right index-finger should then be insinuated at the lower angle of the wound, *hugging closely the inner surface of the pubic bones,* thus avoiding the peritoneum, which may be disregarded. In sixteen operations of this kind which I have performed, I have never in one of them seen the peritoneum nor considered myself at any time in dangerous proximity to it.

As the finger approaches the lower border of the symphysis pubis it lies in contact with the anterior surface of the bladder, which at this point is covered with fatty tissue and a plexus of veins. The fluctuating bladder should be distinctly felt. If there is a doubt about it, an assistant should pass a finger into the rectum and press the bladder forward, which will readily determine its position. The bladder-wall is then fixed by thrusting a tenaculum through its most prominent part. A narrow-bladed knife, cutting edge downward, should be thrust into the bladder alongside of the tenaculum. The entrance of the knife will be indicated by the esacpe of

urine. The vesical incision should be not over a third of an inch in length, just sufficiently large to permit the passage of a sound. The moment the incision is made an assistant takes the tenaculum, while the operator, with the disengaged hand, passes a medium-sized sound between the tenaculum and the knife, using the side of the latter as a guide. The knife and tenaculum should then be withdrawn, and the tip of the sound manœuvred until it enters the vesical orifice of the urethra and its further progress arrested by the posterior wall of the stricture. A second sound should be passed along the anterior urethra until its progress is also arrested by the stricture. Between the tips of the two sounds now lies the stricture, which should be freely divided from tip to tip, not only on the floor, but also on the roof of the urethra. Unsatisfactory results are much more liable to accrue from too little than from too much cutting of the stricture. *The urethral channel should be made perfectly free.*

If the operator prefers he may substitute excision of the stricture for its division; in which case he should excise the cicatricial mass and retain the ends of the urethra in apposition by a row of catgut sutures.

Having incised the urethra as described, the next step of the operation is to insert and retain a catheter in the urethra. This is readily accomplished by snipping off the tip of a soft rubber catheter and slipping the two ends firmly over the tips of the sounds, which present in the perineal wound. The sounds should then be withdrawn, carrying the tube with them, as is shown in Fig. 59. The vesical end of the tube should be adjusted so that its orifice lies just within the bladder and is retained *in situ* by thrusting a safety-pin first through the prepuce, or lip of the meatus, and then through the tube.

This may seem a barbarous means of fixation, but I have seldom had a patient to complain of it, and the absolute security of retention that it gives overcomes theoretical objections.

No attempt should be made to suture the bladder. In the collapsed condition in which it is retained by the drainage of the catheter, the little incision shrinks to still smaller proportions, and leakage of the urine does not

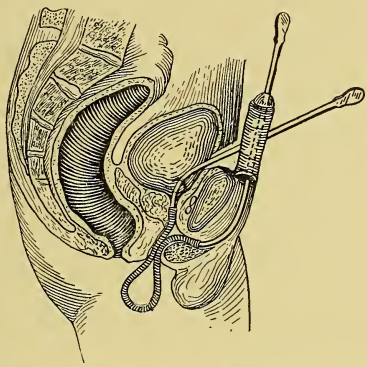


FIG. 59.—Diagram Illustrating the Author's Method of Performing Retrograde Catheterism.

take place. In a comparatively few hours (twenty-four to thirty-six) the incision is sealed so that no escape of the urine need be feared, even if the bladder is permitted to fill.

The abdominal wound should not be sutured, except at its upper and lower angles. A pledget of iodoform gauze should be loosely inserted between the lips of the wound and down into the prevesical space; it should be withdrawn in two or three days and the wound permitted to heal by granulation.

The catheter should be retained in the urethra for two or three days, or even longer; its retention favors absorption of inflammatory or semi-organized urethral exudates, and facilitates the subsequent passage of sounds.

It may be well to add that this method of treating impassable strictures may often be advantageously applied to the treatment of ruptured urethræ where similar difficulties are met with in the catheterization of the bladder.

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